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**THE NATURE OF 'INTELLIGENCE' AND
THE PRINCIPLES OF COGNITION**



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**THE
NATURE OF 'INTELLIGENCE
AND THE
PRINCIPLES OF COGNITION**

BY

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DEDICATION

IN making public this fruit of long labour, I gratefully recall the large degree of cooperation received from others. The first incitement to the work came from my old friend and colleague, Professor Carveth Read. As written, it has throughout received consideration and invaluable comment from two other friends and colleagues of nearly as long date, Mr. Flügel and Dr Aveling. To the latter I have been especially linked by our common admiration for the so misrepresented Schoolmen of the Middle Ages ; there is scarcely a line in the volume that we have not carefully discussed together. My thanks must extend, however, beyond the circle of colleagues to that of students ; to these also, I feel obliged in exceptional measure ; many a tight knot has first disentangled itself under the stimulus of their searching questions. In particular, I should like to acknowledge assistance from the penetrating and judicious comments of Mr. Perera ; often also of Mr. Hargreaves.

But of all my generous helpers, there is one without whom the work could never have been achieved at all, and to whom, therefore, in gratitude I now dedicate it,

MY WIFE.

FOREWORD TO THE SECOND EDITION

OF

"THE NATURE OF 'INTELLIGENCE' AND THE PRINCIPLES OF COGNITION"

OF all the very numerous welcomes given to the first edition of this book, none has been more encouraging than that of my old colleague and friend, Professor Carveth Read. Yet even he, for all his partiality, had to attach to his high rating of the success of the book two notable qualifications. The first was conveyed when he wrote :—" How the principles work out will surprise everyone and delight the disinterested. It will not delight everybody." His other qualification was to the effect that, in the long run, the work must stand or fall by its degree of scientific fruitfulness.

Naturally, then, one turns first for suggestions of improvement to those whom the volume has *failed* " to delight." For these may first be expected to spy out any weaknesses. But in point of fact, the harvest in this direction has been surprisingly meagre. Unfriendly criticism, whenever it has occurred, has almost always been restricted to disapproving or incredulous gestures, without any effort to specify definite grounds for these. Indeed, coming down to brass tacks—as the saying goes—not once does even an attempt seem to have been made to deny that cases falling within the scope of each one of our ultimate laws do actually occur. Conversely, no particular case whatever has been so much as asserted to fall outside their scope. Nor has anyone ever attempted to resolve any of these laws into others more general sti'll.

This freedom from really fundamental opposition remains untouched by such comments—for the most part both valuable and welcome—as have come from Felix Krur

viii FOREWORD TO THE SECOND EDITION

For all these (except certain mere misunderstandings) have had their head and fount in a charge that the present doctrine overlooks the very great influence exerted by the "feelings." The reply to this is simply that these feelings did not fall within the scope of the present undertaking. Pure cognition was found quite enough to deal with at a time.

Perhaps some mention should be made of the fact that one critic strove to replace the present doctrine by another which he conceived to be a development or extension of the theory of "Gestalt." But the actual outcome was only to express the present laws all over again—in much less precise language.

There has been a further criticism that possibly is worth noting; although hard to find in print, it is reported to have been often made orally. It has consisted in urging that the analysis in the present book tend to be of a "logical" nature. But waiving the point as to whether the word "logical" is here used with any definite meaning, and even as to whether the fact of being logical is in any way disadvantageous, I will venture to assert that *every* sort or kind of true analysis of a mental operation is psychologically justifiable to the extent—and no whit further—that it is psychologically fruitful.

In this manner, then, we are brought back again to just where Professor Carveth Read led us. The ultimate criterion of the value of such a work as the present must inevitably lie in the degree that it conduces to further psychological progress. Now, in this respect it would appear to have enjoyed singularly good fortune. Already, in its brief existence of three years, it has supplied original inspiration and continued guidance for researches in very large number. Among instances may be quoted the work of Allenby on the analysis of mathematical operations, that of Bradley on the origin of nature of error, of Davies on the effect of bilingual tutation, of Edwards on memory as compared with habit, Fowler on the usage of rules and examples, of Gopalas-
i on learning by "trial and error," of Hamid on advan-

tageous methods of memorizing, of Laycock on adaptability to new situations, of Lorage on the concepts of a child, of McCrae on the influencing of mental tests by previous opportunities for instruction, of Menon on the processes involved in reasoning, of Simmins on economical learning, of Strasheim on the development of the intelligence, and of Wild on the effect of conation on cognition. Among instances outside our own laboratory may be mentioned the study of dementia by Sherlock, that of schizophrenia by Sullivan, the new direction given to the all-important topic of "formal training" by Ballard, the beautiful investigation of judgment by Stevanić, the very practical treatise of Aveling on the management of mental energy, as also his profound works on external perception and on conation.

But most significant of all for the purpose in hand is the manner in which the present principles have illuminated the doctrine of individual differences of ability. For nearly twenty years our laboratory had been carrying on very numerous and laborious researches on this subject. But now at last—by the light of these principles—every one of these investigations has been seen to fit in with all the others, so as collectively to build up one completely systematic presentation of "The Abilities of Man." On the whole, then, the first edition would seem to have brought forth a harvest of empirical discovery which for abundance and rapidity of growth might perhaps claim to be without parallel in psychological literature.

Fortified by this record of progress accomplished already, the present edition has nothing to retract, beyond some misprints; nor has it anything to add, beyond an index of contents due to the kindness of Mr. A. W. Humphreys. It goes forth into the world with fair hopes of contributing further towards the life-aim of its author—that is, the conversion of psychology into a genuine science.

C. SPEARMAN.

PART

INTRODUCTORY AND

CHAPTER I

"INTELLIGENCE" IN MODERN

ORIGIN OF PRESENT WORK

"INTELLIGENCE" MEASURED BY TESTS.

Success of Ebbinghaus. Theory of Two
Practice of Binet Appeal to Teleology
Obscurantism.

"INTELLIGENCE" OPPOSED TO "INSTINCT"

Bergson Psychologists.

REAL MEANING OF THE WORD.

Kinship to "Intellect" Degeneration.

ORIGIN OF PRESENT WORK

NEARLY two decades ago a series of researches were
by me for the purpose of investigating what is
called "Intelligence." But the method employed
objective sort. That is to say, instead of the method
being directly analyzed, clues to their correlation
sought in certain statistical properties being
played by their intercorrelations.

Such an omission of all, or nearly all,
has since frequently incurred reproach.
had, in fact, been but a portion of a larger
study. The other portions had only to be
to be executed with the greater thoroughness

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less for publication. The analysis, in particular, forms 100 pages. The point of view will be mainly descriptive. A sketch will be given as to how intelligence, which were the chief objects of the kind of attempts have been made, why none of the so far proffered has been satisfactory.

INTELLIGENCE MEASURED BY TESTS

To-day present day a large number—perhaps in the best accredited textbooks on psychology, much as mention the word "intelligence" to cover. Nor is any compensating made for synonymous expressions. The whole subject is among the most familiar in ordinary life, but it has been in systematic psychological study largely ignored. Its acquirement of interest in the past may be traced, rather, to the sporadic efforts which have come from experimental workers. For the last few years and more occupied themselves with subjecting intelligence to measurements by means of mental tests. Experimental activity is now assuming gigantic proportions. Its sphere of application has included, as is the case with the whole American army. An example that illustrates the rapid development in England also is the more recent testing of about 30,000 candidates for the army. And signs are not lacking that, before long, measuring will have been extended to the intelligence of the nation, and perhaps to much more.

Thus. In the course of such a tremendous task, a question could not but arise with great force. After all, is the real nature of this "intelligence" a great attempt to grapple adequately

"INTELLIGENCE" IN

with the problem was made still far from sufficiently apprehensive in 1897.¹ Mental tests had, employed previously, beginning with the most original of British psychologists, Galton, and the investigations of many others, as Oehrn, Scripture, Dressler, Griffin, Bourdon, Binet, Titchener, and Wagner. In most of these, too, already been made attempts to bring the various cognitive powers into some relation to intelligence. Sometimes there had even been instituted statistical comparisons between, on the one hand the experimental results, and on the other the degrees of intelligence as estimated by teachers. But no effort seems to have been ventured as yet to show by genuine psychological analysis that intelligence really falls within the scope of such tests at all. Indeed, the names given to these—sensory discrimination, memory, association, attention, and motor dexterity—were indicative rather of the contrary.

Ebbinghaus, however, took a new and bold step. Analyzing most ingeniously the performances by which men actually distinguish themselves for intelligence in ordinary life, he arrived at the conclusion that such performances invariably consist in "bringing together a multitude of independent concomitant impressions into a unitary, meaningful, or in any way purposive whole."² Accordingly, the essential nature of intelligence was declared by him to be, in a word, "combination."

Guided by this view, he proceeded to construct his well-known test, in which certain words or syllables of a prose passage are left blank and have to be filled in as well as possible by the person under test. This simple procedure, which to the uninitiated might seem to be only a childish puzzle, did actually attain to an extraordinary degree of success. Not all the restless invention of psychologists in every quarter of the globe has to this day been able to

¹ *Zeit. f. Psychologie*, xiii. p. 401.

² *Ibidem*.

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test which, on the whole, yields intelligence as evaluated in other tests, and, this success of passage-completion on a single test has since been discounted by the whole employment of such tests singly has now been abandoned. And as regards his analysis, the view that intelligence consists in "combining" does, indeed, still retain some adherents, notably the eminent Italian, de Sanctis.¹ But various rival theories have since been proposed and widely adopted instead.

Still more serious for his view, however, would appear to be the following consideration. Mental powers have in general what is commonly called a "formal" nature; that is to say, they are determined only by the form of the operation, not by the subject-matter to which the operation is applied. And there has always existed a strong inclination to assume that such a formal power operates in a unitary manner, so that those persons who possess it in high degree for one subject-matter will have it correspondingly for others also. This assumption, however, does not bear scrutiny; at any rate to assume anything like a *universal* correspondence of this kind—so that, for example, the man with the greater power of imagination for chess must necessarily have it also for music—is a palpable fallacy. Now, this fallacy of formal power can be charged against the Ebbinghaus theory; for the latter essentially implies that every person able in any degree to combine the subject-matter of the test will have a proportional ability for combining other subject-matter also, including that of ordinary life.

Theory of Two Factors. There is little cause for surprise, then, that a few years later a very divergent view was advanced. Evidence was here brought forward to show that operations of the same form but varying subject-matter are, indeed, executed well by the same person usually, but by

¹ Conferenza tenuta al Circolo di studi psicologici di Firenze 14th March, 1913.


no means always. In other words, incomplete correspondence with observable mathematically possible correlations, however, it does not now de-
 to exist when even the form of the same but widely unlike. This success of the same person throughout a form and subject-matter—that is to say, three conscious aspects of cognition whatever—applicable by some factor lying deeper than the phenomena of consciousness. And thus there emerges the concept of a hypothetical *general* and purely *quantitative* factor underlying all cognitive performances of any kind. Such a factor as this can scarcely be given the title of "intelligence" at all; being evoked to explain the correlations that exist between even the most diverse sorts of cognitive performance, it does not deserve a name appropriate to any one particular sort. (On this view, accordingly, the name is commonly written in inverted commas, or else replaced by the simple letter *g*.)

Such a general and quantitative factor, it was said, might be conceived in an infinitude of different ways, including those which would assign to it the most subtle, abstract, or complex constitution. But a readily intelligible hypothesis was suggested to be derivable from physiology. The factor was taken, pending further information, to consist in something of the nature of an "energy" or "power" which serves in common the whole cortex (or possibly, even, the whole nervous system).

But if, thus, the totality of cognitive operations is served by some general factor in common, then each different operation must necessarily be further served by some *specific* factor peculiar to it. For this factor also, a physiological substrate has been suggested, namely, the particular group of neurons specially serving the particular kind of operation. These neural groups would thus function as alternative "engines" into which the common supply of

INTELLIGENCE INTELLIGENCE

test which, on the naturally distributed. Schem-
 intelligence as might be depicted by the following
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 been at
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The diagram shows a stylized outline of a human brain. In the center-right portion of the brain, there is a small, irregularly shaped area that is shaded with diagonal hatching. Several curved arrows originate from different points on the outer surface of the brain and point inward, converging towards the shaded patch. The arrows are distributed across the top, sides, and bottom of the brain's outline.

FIG. 1

The whole area represents the brain, whilst the shaded patch is some special group of neurons (for convenience of the figure, taken as collected in one neighbourhood). The arrow heads are the lines of force coming from the whole cerebral cortex. In this manner, successful action would always depend, partly on the potential of energy developed in the whole cortex, and partly on the efficiency of the specific group of neurons involved. The relative influences of these two factors could vary greatly according to the kind of operation ; some kinds would depend more on the potential of the energy, others more on the efficiency of the engine.

Although the discussion of this theory must be reserved for a later work, we cannot avoid immediately indicating one obvious and most important corollary of it. This is that by *pooling* a sufficiently large number of any diverse cognitive operations whatever, the general factor can always be brought as nearly as desired to sole influence. For each specific factor, since in such pooling it occurs only once out of many times, must necessarily become of correspondingly insignificant weight. Conversely; the general factor, since it occurs every time, must in the end become paramount. But if that be so, then *any* two such extensive pools will arrive at approximate accordance with each other. And should one such pool be obtained for any person by means of tests, it must accord more or less well with the

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ordinary estimate that any other person's
this estimate is likewise of the nature
derived from quite different data.

Theory and Practice of Binet. In the
1905, there arrived the epoch-making work
Simon. A paper was published by them on
Development of the Intelligence of Children.
people in France, including the Ministry of Public
Education, had become uneasy about the methods in vogue
deciding whether a child's intelligence was to be considered
as "deficient," a verdict which so gravely affects his whole
subsequent career. In view of this difficulty, these two
investigators, the one a psychologist and the other a
psychiatrist, entered into partnership for the following
purpose :

"To invent a large number of tests, at once rapid
and precise, and presenting progressive difficulty ; to
try these tests on a large number of children of different
ages ; to note the results ; to see which tests succeeded
for a given age, but cannot be done as a rule by
children even a year younger ; to construct in this
manner a metric scale of intelligence, which permits of
determining whether any given subject has a normal
intelligence for his age, or is backward, or forward, and
how many months or years this backwardness or
forwardness amounts to."¹

This new and attractive scale of tests was soon put on
trial by many other psychologists, the most notable instance
being its application by Goddard to "the entire school
population of one complete school system," thus including
about 2,000 children.² In all these cases, the eventual report
was favourable, or even enthusiastic. From that time
the public interest in the matter has continually waxed

¹ The tests were first given in the *Année Psychologique*, ii. 1905. The
quotation is from *Les idées modernes sur les enfants*, 1909.

² *The Training School*, vi. no. 1, 1910.

OF "INTELLIGENCE"

and, this success at last the literature devoted to the single test mon became so immense that a special journal was published periodically in order to announce the results of the experiments.

analysis: hope of arriving at a finally successful theory in "conscience" is raised to a climax. Let us turn, then, to the doctrine from which the great achievement of these investigators had derived its inspiration. This doctrine was founded with all explicitness. It still essentially contains a formal power, although now an altogether different one from that advocated by Ebbinghaus. The two authors write as follows:

"Our object is to appreciate a level of intelligence. But here, it is necessary to come to an understanding as to the sense of that word so vague and so comprehensive, 'intelligence.' Almost all the phenomena with which psychology occupies itself are phenomena of intelligence; a sensation, a perception, are intellectual manifestations as much as reasoning is. Ought we then to allow the measure of sensation to intervene in our examinations, as is done by the psycho-physicists? Ought we to put the whole of psychology into the tests? A little reflection has shown us that this would be a great loss of time. There is in intelligence, it seems to us, one fundamental organ, an organ whose defectiveness or alteration has the most importance for practical life: this is judgment . . . A person may be feeble or imbecile if he is lacking in judgment; with good judgment, he can never be so. The test of intellectual psychology appears of little importance beside judgment. Memory is distinct and independent of judgment."¹

Thus, these investigators, although persisting, indeed, in the old opinion that what they are measuring is properly describable as intelligence, now at least adopt a laudable circumspection as to the meaning of this word. Eventually,

¹ *Année Psychologique*, xi. 1905, pp. 195-7.

" INTELLIGENCE " IN MO:

however, they decide that what it me
should be measured by way of its
judgment.

But hereby they would appear to com
the same old fallacy of taking their formal p
a unitary nature. For their whole plan implies
in judging the kind of subject-matter supplied b
will always be proportional to that in judging a
kind. To our surprise, moreover, after thus sugg
that for the tests to go beyond this " judgment " w
only be " a great loss of time," they disclose to us a fe
pages later that more than half of the tests actually employed
by them diverge intentionally into the very powers just
rejected, that is to say, sensory and memorial. For now
they write :

" The tests to which we shall have recourse seem
capable of distribution into three distinct categories :
(1) Tests of memory ; (2) Tests of intelligence which
are partly done with the help of language ; (3) Tests of
sensorial intelligence."¹

And the surprise may excusably deepen into very great
astonishment on finding that, instead of each of their " three
distinct categories " ever being considered separately, all
are at once thrown quite promiscuously into one single pool.
Such a procedure would appear to be altogether irreconcilable
with their theoretical exposition, or with any theory whatever
of unitary formal powers. Instead, it is just what was
demanded by the opposite theory which has been pro-
mulgated the year before.

Four years later Binet defines this intelligence in a
completely different manner. He now writes :

" Comprehension, invention, direction, and cer-
ship ; intelligence lies in these four words. C
quently, we can conclude already from what p

¹ *Ibidem*, p. 257.

" INTELLIGENCE "

actions, which are primordial, may have been studied by our method." ¹

are involved not one but four believed primal powers. Obviously, the total result cannot possibly measure all four: the better one of them the less well can it fit the others. Less, he still does not propose any alterations in the nature of the tests, or even in the mode of estimating the results, so as to evaluate each of these " primordial actions " separately. And our puzzlement reaches its climax when a single one of them, invention, although thus declared to be primordial, is on the very same page analyzed into " a crowd of faculties," including " memory, imagination, judgment, and especially language." It would seem as if, in thus inconstantly flitting hither and thither, Binet can nowhere find a theoretical perch satisfactory for a moment even to himself.

On the whole, then, it is difficult to avoid the conclusion that these investigators, although they believed themselves to maintain the old theory that the tests measure some genuine " intelligence " consisting in one or more formal powers, nevertheless in their actual practice had totally abandoned this theory in favour of the opposite one of Two Factors. To this complete, however unconscious, practical recantation their extraordinary triumph would appear to have really been indebted. Had Binet, consistently with his professed theory, attempted to furnish separate measurements of the powers of " judgment," or of " comprehension," or of " direction," or of " censorship," then not all his admirable ingenuity, resolute perseverance, and fascinating exposition would have availed to win for him any substantially greater success than these same tests had already been securing for his long previous career. **described to Teleological Biology.** All the above-mentioned circumstances and researches have since been pursued with great

¹ *Les idées modernes sur les enfants*, 1909, p. 118.

ardour. But the fact that the procedure really derived from that of any formal power appears. Consequently, the same old search powers was still persisted in; and, the same old fruitlessness. When at last the weaken from constant discouragement, frankly ceased, but only took refuge in term vagueness. A transition eventually ensued writers have described as an abandoning of the "s in favour of the "functional" kind of psychology, but really quitted psychology altogether. It passed over biology; not, however, the investigatory physiological science, but that which explains life *a priori* and teleologically in such terms as "environment" and "responses." "Intelligence" is now asserted to consist in *adaptability to new situations*.

The not infrequent citation of Binet on behalf of this proposition would appear to be doubtful legitimacy. He more often and with greater emphasis attributed such adaptation to "attention."¹ And this latter power, far from being (as commonly reported) identified by him with intelligence, was, on the contrary, contrasted with it.² But even waiving this dubious support, the proposition can beyond question count on its side a very large and continually increasing array of advocates, among whom stands no less an authority than W. Stern.

Now, in so far as this proposition intends to be teleological only—and perhaps Stern himself would go no further—we certainly have no quarrel with it here; such a topic transcends our scope. But against those numerous authors who would take the statement to be a psychological definition of the intelligence measured by tests, a vigorous protest must be entered.

In the first place, those who uphold it do not even attempt to show its value for practical purposes; instead, they

¹ *Année Psychologique*, vi. 1899.

² *Ibidem*, ii. 1895.

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pooling borrowed from the rival
this view, just as much as those
gives the fallacy of formal powers.
shifting the burden of a psychological
logical ground, is only an explanation of
rhus.

section goes deeper still. It is that the
intelligence as adaptability to new situations
can try to deal with the nature of this power,
with its *employment*. Such an attitude is like
fer of the child who, on being asked what is meant
"chair," replies that it is to sit on. If even in children
sort of definition is well known to be a sign of mental
inferiority, in the science of adults it must betoken at least
a strange crudeness. Surely by this time we ought to
have learnt the lesson of Socrates

"To the question about clay (as to what it is), it
is a plain and simple answer to give, that clay is earth
mixed with moisture, without mentioning what use is
made of it" ¹

Miscellaneous Views. Although the preceding views of
"intelligence" have obtained the most conspicuous advocacy,
others also are advanced and, indeed, in endless
variety. A fair notion of their general character can be
gathered from the important recent symposium on the
matter, to which no less than fourteen prominent authorities
on mental testing contributed each a paper.² Of
these only three, Colvin, Pintner, and Peterson, seem to
have been satisfied with the above-mentioned teleological
standpoint. Somewhere near to it came Thorndike and
Buckingham, since they define intelligence respectively as
"the power of good response, from the point of view of
truth" and as "the ability to act effectively under given
conditions." Akin is its definition by Woodrow as a
"capacity to acquire capacity," the latter or acquired

¹ Plato, *Theaetetus*, 147 c.

² *Journ Educ Psych* vii 1921

"INTELLIGENCE" IN M:

capacity being "for success, either man, who elsewhere seems perfectly Binet,¹ here unexpectedly takes up position, seeing that he now defines intelligence of "abstract thinking." Haggerty, Thurston, replace such simplicity of definition by, though each in an altogether different way from Dearborn, nevertheless, roundly declares that, the new illumination afforded by behaviorism, the one single "accepted definition of intelligence," as "the capacity to profit by experience." Far other is the matter regarded by Ruml, who goes so far as to say that the nature of intelligence can at present hardly be discussed at all, owing to the vagueness of the terms involved and our paucity of information about the facts. Pressey takes the matter more lightly, he says that "although a large part of his time goes to work with tests of intelligence," "yet, frankly, he is not very much interested in the question" "as to what he conceives intelligence to be."

Without here attempting to discuss all these interesting views in detail,² the following brief comments upon them may be allowed. Their most obvious feature, perhaps, is their ominous discrepancy among themselves. Another unpromising sign is the lack of even an effort to obtain in support some tangible proof; no one seems to bring any factual evidence that intelligence as defined by them does really occur in any particular performances, or constitutes the actual basis of any particular estimates, or is veritably measured by any particular tests. Indeed, it is hard to see that the definitions have so much as furnished their own authors with guidance in constructing their own tests. And

¹ *The Measurement of Intelligence*, 1916, p. 47

² Thus, Freeman formulates intelligence as the sum of seventeen items, one being for example "sensitiveness to significant combinations between experiences which illuminate one another or which are effective in building up systems of thought."

³ It is intended to consider them more fully in subsequent work on individual differences and their measurement.

that, in point of fact, this word in its ordinary present-day usage *does not possess any definite meaning*. It can be readily made to comprise, no doubt, anything that was classically attributed to the "intellect." But commonly it is stretched to an undetermined distance further downwards. Neither its utterers nor its hearers appear to have behind it any clear idea whatever.

CHAPTER II

PSYCHOLOGICAL ULTIMATE LAWS

BACK TO GENERAL PSYCHOLOGY.

Complexity of Problem. Road to Solution.

THE PRESENT CRISIS.

Internal Discord. Stagnancy. Apparent Advances. Damnatory Verdict of James.

NEED OF ULTIMATE LAWS.

Deficiency hitherto. New Bright Outlook.

BACK TO GENERAL PSYCHOLOGY

Complexity of Problem. Since thus the word "intelligence" has in modern times so degenerated as to become scientifically unusable, what is now the wisest course to take with it?

There are many alternatives. One would be simply to renounce using it altogether. Another would be its restoration to the original status, as merely signifying the actual exercise of the faculty of intellect. Yet a third plan would be to confer upon the word some more or less novel and improved meaning. This last course, naturally, can be further subdivided according to the different lines into which such a change of meaning may possibly be directed.

Moreover, when setting out to choose between these various alternative policies, there are numerous and diverse motives which should each be allowed to bear its due influence. To begin with, the general limitation should be recognized that words are not like algebraic symbols, capable of being invested with any signification at will; both their present customary usage and also the position held by them

in classical literature have need of being taken into careful account, on pain of eventually engendering endless confusion. After all such proper regard to the limits of what is possible, there must follow an appreciation of what is positively desirable. Foremost here comes the proposal often made or implied, to modify the meaning of intelligence in such a manner as to fulfil the great task which psychologists have already sought to impose upon it, of serving the purposes of mental tests. This, too, might be attempted in various ways. For instance, the word might be expressly reserved to denote without prejudice whatever these tests may some day, after full investigation, show themselves actually to measure. But before finally disposing of the word after this or any other fashion that may be deemed advantageous for the topic of mental tests, we ought certainly to remember that there are also several other claimants to have a say in the matter. For example, there are all those psychologists and philosophers who, as we have seen, require the concept of intelligence for the purpose of elucidating that of instinct. Can we be sure that these will be satisfied with the same definition as the mental testers? At present such a prospect of agreement seems extremely remote. And furthermore, there are many other aspects, branches and schools of psychology that can also fairly add their voices to the discussion. Scholasticism itself is still very far from extinct; in fact, it appears about to enter upon a phase of great revival; and in any settlement of the meaning of intelligence, it possesses an indubitable claim to be heard before all others.

Road to Solution. Having regard to these manifold alternative courses and conflicting motives that must all receive consideration in any adequate solving of the problem, one conclusion emerges with irresistible force. It is that the solution cannot be settled offhand with eyes fixed upon any special need—be this that of mental testing or otherwise—to the exclusion of all further considerations. Instead, the matter extends its bearings, and must

necessarily extend them, throughout the whole science of cognition.

Still more irrefragably arises the same conclusion on passing from this relatively superficial comparison between alternative courses and entering into a deeper examination of any single one of them. For example, suppose that somehow or other the decision has eventually been reached to take the term intelligence as nothing more than the handmaid of mental tests; and suppose the particular view to have been adopted, that what these tests ought to measure is a person's average ability. We shall remain impotent (see p. 14) to attach to this term "average" any clear idea whatever until we have managed to show what precisely are meant to be the different kinds of ability from which the average is to derive. But to show this involves necessarily a setting forth of all possible kinds of cognitive performance in some comprehensive system. Once more, then, we are driven to realize that no serviceable definition can possibly be found for intelligence until after having firmly established at least the framework of the entire *psychology of cognition*.

THE PRESENT CRISIS

But the adoption of this new objective may be fraught with momentous consequences. For we become tempted to inquire next about the state of this entire psychology itself. Is all really well with it?

Internal Discord. Even to ask such a question may perhaps to many seem unwarrantable. For on all sides, as it would appear, general psychology is with absolute confidence assumed to have taken in modern times tremendous strides forward. Nevertheless, although most wishful to accept this optimistic estimate, the hard fact remains that on actually appealing in our present sore need to this psychology as represented in the current text-books, we can extract from it astonishingly little assistance. Indeed,

the very authors who pronounce the widest reaching statements about intelligence on special occasions—such as the discussions of mental tests or of instinct—nevertheless when they proceed to write a general text-book do not even mention any such thing.

It would be consolatory to be able to think that this breakdown on trial in practice stands at any rate alone. And one can readily enough call to mind contrary cases, where psychology has been remarkably successful in practical applications, such as educational, medical, and even industrial. But can the credit of such successes be fairly attributed to the systematic psychology as expounded in the general text-books? It appears impossible to answer affirmatively. In almost all such cases the systematic psychology seems most strangely to have played no active part whatever.

On turning from practice to theory there is revealed a fact of still worse omen. This is the surprising state of chronic conflict between one authoritative exposition and another. Take, for example, the systematic works of Ziehen, Cardinal Mercier, Tansley, and Watson. In no two of these does the subject-matter seem to deserve even the same name. What a contrast is offered by the unquestionably sound sciences, as physics or chemistry! In these the divergencies always remain confined to points of detail; in psychology they reach out to the very foundations, even to the whole terminology itself.

Strangest of all in this respect of internal dissension is the nearly complete divorce that prevails between all such general psychology in text-books and on the other hand the work of the laboratories. Whilst these latter are continually growing more numerous and more productive, the bulk of the text-books remain little, if at all, affected thereby. Edition follows edition with almost no enrichment from the experimental investigations, but solely from the author's own inward development.

Stagnancy. Underlying all this warring of schools and disunion of methods, does there not lie at least some ultimate

foundation more or less definitely adopted in the large majority of cases? So much, indeed, may be said to exist; but it appears to be almost confined to one single point. It consists in deriving all mental activity from some small number of different powers. And this, after all, is only the old doctrine of "faculties" with which psychology originally commenced, both in ancient Greece and in ancient India. Even with respect to detail, it must here be maintained,¹ the portrayal of these faculties has on the whole rested remarkably constant. At the head of them has always stood (whether so named or not) the Intellect, whilst the others most frequently advocated have throughout continued to be Perception, Memory, and Imagination.

On arriving at the present day, no doubt, we find the doctrine of "faculties" everywhere mentioned in terms of keenest reprobation. Such hostility, however, shows itself on closer examination to be curiously concentrated against the *name*. Just the same actual doctrine is still freely accepted under very numerous synonyms, as "powers," "capacities," "abilities," "properties," and so forth. Despite all protests to the contrary, this ancient doctrine has in good truth not even yet been abandoned. Modern authors seem, rather, to have been incapable of abandoning it; for they have discovered nothing acceptable to take its place. Really, they have done no more than relax in effort to express it with rigid precision. There has even been preserved in unabated, nay enhanced, degree the most harmful fallacy it ever engendered, namely, that formal powers function unitarily (p. 4). The "intelligence" itself is an arch-faculty.

As regards the further present-day handling of the doctrine, notably large claims have been put forward on behalf of the faculty of "attention," alike in respect of its modernness and of its merits. But both the one and the other are disputable. In truth, this "attention" was introduced into psychology some two thousand years ago; and

¹ See Note 2 to p. 19.

a case might be made out to prove that nothing radically new has ever been added to it since. To the faculties of "apperception" and "assimilation," no doubt, a very different tribute must be paid; these two are, indeed, modern products of unsparing labour bestowed by very eminent thinkers. Yet both have become notoriously equivocal; and the developments of the present volume will, it is believed, show that neither term in any of its diverse meanings can supply what psychology really needs. As for the popularly favoured "analysis" and "synthesis," these cannot make good their title to constitute mental powers or processes of any sort; at best (as will be shown later on) they only indicate certain results to which a variety of processes can eventually lead. There are innumerable further faculties, which may be encountered in the psychological literature of the present day, but which cannot be said to have gained any footing in its general psychology. They have only been invented by experimentalists in moments of temporary embarrassment; not even their authors try to make use of them systematically. Among such are those of "censorship," "planning," "thinking selectively," "building up complexes," "applying what has been learnt," and so forth without end.

Although thus modern general psychology would appear to have added astonishingly little to the orthodox doctrinal foundation, it might at least be credited with great originality in heterodox directions. But even this much seems to be doubtful. The sole serious rival to the doctrine of separate faculties is that which, far smaller in both number and eminence of its advocates, has tried to resolve all knowing ultimately into sensation, and all thinking into nothing more than associative reproduction. But this senso-associationism, although indeed holding out an unmatched promise of scientific simplicity, breaks down by reason of flagrant conflict with the actual facts. In any case, it certainly lacks the character of modernness; its associationist constituent goes back at least a couple of centuries,

whilst the sensism is co-ancient with the doctrine of faculties itself.

Apparent Advances. From all these unfavourable aspects of modern general psychology, let us turn to its compensating virtues. One such might seem to be given in our immensely improved knowledge of the sensory organs and in the very interesting suggestions as to the cerebral processes subserving consciousness. But these assets are in large measure only on loan from physiology; and on the whole, our utilization of this rapidly rising sister science would appear to have been lamentably inadequate, both in degree and especially in kind. Unquestionably again, there has been a ubiquitous leavening of psychological doctrine with the theory of evolution. But here a discomfiting suspicion arises that psychology is just that domain where the evolutionary theory has begotten its minimum of sound science and its maximum of facile ex-cogitation. Closely connected with the last matter is the greatly developed modern tendency to view psychological events from the standpoint of teleological biology. But even this tendency, meritorious as in many respects it really is, would appear to have tempted not a few authors to cover up deficiencies of sharp thinking by masses of loose verbiage. Genuine psychological explanations are more and more frequently shirked; in their places are offered glib references to "situations," "environment," "responses," and so forth. The lesson seems needed that psychology is no mere flower of biology, but one of its greatest roots. Instead of trying to explain the nature of the mind by the necessities of living, we should derive, rather, the capacity to live from the nature of the mind, and therefore ascertain this nature *independently*.

Apart from these dubious exceptions, the virtues of even the best modern systematic works appear to be only such as cannot be absent from any writings whatever of great men on great subjects; that is to say, many deep thoughts and much felicitous language. Taken as wholes, these works always seem to suffer from some deep-seated fatal limitation;

this is manifested in the fact—unknown to the really progressive sciences—that they never arrive at rendering the older fine works in any way obsolete. Thus, we moderns can afford to look at Archimedes patronizingly, as down at a brilliant child ; but Plato, Aristotle, and Aquinas, not to mention many others, even yet oblige us to look upwards as at our masters.

On behalf of modern psychology, there remains still a defence, and one, in appearance, of invincible strength. For is it not to our own times that is owing the introduction of the great experimental procedure ? And has not, by this means at any rate, a most lively progressiveness been achieved ?

Here, indeed, our note may well change to admiration, unstinted and enthusiastic, so long as we only compare present deeds with those of pre-experimental days ; but not when we compare them with what can be, must be, and *will* be done by this procedure. The experimental growth is still in its infancy ; and it appears to suffer from some pernicious infantile malady. Its results, dazzlingly important though they may sometimes be, are nevertheless astonishingly exiguous in proportion to the enormous outlay of labour upon them. Even at their best, they always fall most disappointingly short of what had seemed to be their legitimate expectations. Their triumphs attain to the dimensions of splendid raids, rather than to those of consolidated conquest.

All this experimental weakness appears traceable to one profound source. It is that, if the exponents of general psychology fail to assimilate the experimental results, so too the experimentalists on their side are unable to weave their results into any coherent general psychology. Even their most successful feats in practice do but embarrass them in theory. Their puzzlement, for instance, at the correlations found to exist between different mental tests might almost be likened to that of a hen at having hatched out a duckling which forthwith takes to the water. To

convert the saying of Kant, if the general without the experimental psychology is empty, so, on the other hand, the experimental without the general is blind.

Damnatory Verdict of James. Lest we should be accused of painting all this in too sombre colours, especially with respect to the text-books, let us quote the authority of him who is almost universally admitted to have himself produced the greatest of them, the brilliant and honest William James. In the closing words of his book he sums up the whole content of modern general psychology—the development of the experimental work he unfortunately did not live to see—in the following passage of unsurpassable gravity:

“A string of raw facts; a little gossip and wrangle about opinions; a little classification and generalization on the mere descriptive level; a strong prejudice that we *have* states of mind, and that our brain conditions them; but not a single law in the sense in which physics shows us laws, not a single proposition from which any consequence can causally be deduced. We don't even know the terms between which the elementary laws would obtain if we had them. This is no science, it is only the hope of a science.”¹

NEED OF ULTIMATE LAWS

With his next breath, however, James proceeds to add a hope, even a conviction, that some day or other the general psychology will at last triumphantly emerge from this state of primitive darkness. And the same hope is ardently shared by the present writer. To have found a chaos and left a science, *this* is the modern movement, to contribute to which has been the ideal of the following volume.*

Deficiency hitherto. The ground fact is that every science, in order to deserve the name, must necessarily be built up on some pregnant system of *principles*. This

¹ *Psychology, Briefer Course*, 1892, p. 468.

word, of course, presents itself in current psychological literature abundantly enough: it even figures perennially upon title-pages. But are the goods delivered? Nothing more appears to be really offered than considerations of a very broad character. Widely different is the kind of principles so urgently needed by psychology (and by every genuine science); these, as already the passage quoted wisely indicates, consist in *ultimate laws*. Never can the place of these be satisfactorily taken by any "faculties," even if such were to be supplied—as is, in point of fact, quite feasible—that are strictly true. These usually do but divide up mental activity into compartments. At most they only express similarities, whereas the mission of science is to establish regularities. Deeper than the uniformities of occurrence which are noticeable even without its aid, it discovers others more abstruse, but correspondingly more comprehensive, upon which the name of laws is bestowed. Bottommost lie a certain number of these laws which are not explicable by anything further, but rest in their own good right. These should be all-comprehensive; every process which can be observed within the domain of the science which they underlie either ought to be subsumed under them, or at least should offer a reasonable prospect of being so subsumed eventually. To such laws as these the name of ultimate is given; they constitute "principles" in the fullest sense of the word. When we look around for any approach to this ideal, something of the sort can actually be found in the science of physics as based on the three primary laws of motion. Coordinate with this *physica corporis*, then, we are to-day in search of a *physica animae*.

New Bright Outlook. To provide psychology with such a foundation is by no means a novel proposal. One brave attempt was made by Hartley with his associationism. But this may now be regarded as having failed; the superstructure, rickety from the first, is at present only a still dangerous ruin. On even bolder lines, again associationist, was a foundation of principles devised by Herbart.

These also, however, showed themselves to be inadequate : the superposed edifice, vast but jerry-built, collapsed immediately. Another memorable foundation of principles, associationist once more, was laid by Spencer. But the psychology which it was intended to support can scarcely be said—despite a wealth of incidental profound and fruitful thoughts—to have ever stood erect at all.

On turning to the present day, however, the very desire for genuine principles—the conception even of what really constitutes them—would seem to have been lost. To a large extent their place has been taken by a mere phantasmagoria of metaphors, or what comes to nearly the same thing, by new principle surreptitiously introduced *ad hoc* to meet each particular emergency.

Indeed, after the catastrophic failures just mentioned, any further attempt to lay down genuine principles might perhaps appear more adventuresome than wise. But there appears to be a circumstance by which the outlook, otherwise seemingly hopeless, becomes wonderfully brightened. We must remember that, although principles are necessary for establishment of a science, they are not sufficient alone for this purpose. There is furthermore required the aid of active research—as a rule, experimental—in order to verify, develop, and fructify them. Consider the part played by these two agencies in the history of the material sciences. The great principles of attraction and repulsion, of atoms, even of ether, had been enounced as early as the days of Leucippus and Democritus at least. Yet not until they were verified—at the time of the Renaissance—their indispensable complement of research, could their marvellous potency at last become actually efficacious.

In the history of psychology, events have separated in reverse order : not the discovery of principles, but the development of research, has occurred first. We think we can discover the true principles only by the achievement of research. And from none perhaps better than Spencer—showing

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discovered, they would complete just the conjuncture needed to set going a Renaissance in psychology also.

Herewith, it may be added, is given the reason why the present volume displays a double title. Any search after "the nature of intelligence" has shown itself to have a prospect of success when, and only when, it becomes merged into the greater quest after the scientific "principles of cognition."

PART II

CONSTRUCTIVE

CHAPTER III

"SENSATION" AND ITS ANTECEDENTS

THREE IDEALS.

Clear Thinking. Ultimate Laws. Experimental Procedure.

SENSORY EXPERIENCE.

Concept of "Experience." The Physical World. Afferent Nerves. Sensorium. "Sensation." Primary Sentience.

THREE IDEALS

To the preceding two chapters has fallen the ungrateful task of destructive criticism. Charges so grave have had to be brought against the state of psychology hitherto, as even to impugn its claim to have established for itself any genuinely scientific foundation at all.

Turning now to the higher work of positive reconstruction, we may profitably call to remembrance, no longer the faults, but instead certain eminent merits, that have been conspicuously shown by particular schools. These, it is hoped, will furnish us with ideals that, even if impotent each separately, may nevertheless be happily effective in combination.

Clear Thinking. Of such ideals three stand out as paramount. The first is that of clear thinking. In this respect moderns may well study the achievements of very many earlier times. And from none perhaps better

commonly despised Scholastic authors can the prime lesson be learnt, that before even attempting to argue upon points of fact, there should first of all be obtained definite and unequivocally expressed ideas.

Ultimate Laws. The second of our ideals is that whose cult will give to the following pages their both outward and inward dominant character. It is one that can nowhere be found in all the current efforts to build up psychology on bio-teleological speculations, thus taking for its basis what should, on the contrary, be awaited as its roof and crown. It must be sought, rather, in the very school which otherwise seems most of all to have hitherto perturbed and hindered the development of psychology; that is, the school of associationism. It consists in the demand that psychology should have its foundation in the solid rock of genuine principles, taking these to mean ultimate laws. Such alone are of a nature to fulfil the two greatest missions of empirical science; in the first place, anticipation; and in the second, control.

Experimental Procedure. For our third and last ideal we need no longer look backwards, but may with pride turn to a wonderful discovery made by our own generation. If any present searcher after truth would deal effectively with the great riddles that have baffled all previous ages, he must at least be armed with more potent methods of procedure than they possessed. Not by sheer force of greater ability does the inquirer of to-day appear likely to outstrip all the grand thinkers who have gone before. Our chance of surpassing them scarcely lies in any superior power of constructing theory, but rather in the newly devised cooperative methods of amassing constructive material. The great modern point of vantage is the experimental procedure, long the chief tool of the physical sciences, and now last brought by Weber, Fechner, and Wundt—in rising order of genius—to the aid of mental science also. Here is a lever which, on occasion, can make a modern pygmy as strong as an elephant. Always, however, we must bear in mind that

experiment, like other powerful tools, is as dangerous as it is powerful, as full of fallacies as of promise.

The assistance of this experimental procedure will in the following pages be invoked, not as an exceptional resource in cases of trouble, but systematically throughout. In particular, it will be asked even to furnish us with examples. By most writers these are chosen, either from ordinary life on account of its so-called practical nature, or else from the mental operations of children and the lower animals on account of their believed comparative simplicity. But both these sources are alien to the veritable scientific spirit. As regards the anecdotal exemplifications from ordinary life, there is no reason why these—even when the events have really occurred at all!—should be any whit more fitted to prove psychical than physical laws. And as for the alleged conscious operations of young children and the lower animals, to build upon these is to renounce any basis in definitely ascertained or even ascertainable fact of any kind, and to take stand instead upon the quicksands of unverifiable conjecture.

Very commonly, we shall adopt a further and perhaps even less generally approved procedure ; a large proportion of our examples will be sought in what many of the older authorities still regard askance, or even condemn as superficialities, artifacts, if not downright quackeries, but which we here, on the contrary, must uphold as the most live and futureful shoot of all contemporary psychology, to wit, mental tests. These we obtain a great and ever-increasing record of cognitive processes endowed with truly experimental virtue. For they are executed under selected and standardized conditions ; they thus fulfil the primary scientific postulate, that of being verifiable.

And if in this manner the tests promise to render invaluable service to the principles, even more may the latter hope to benefit the former. For these tests are, as it were, miners excavating forward into wonderfully rich new ground, but repeatedly missing the correct direction on account of

labouring in darkness. The light they need is just that which irradiates from principles—from these alone.

SENSORY EXPERIENCE

The Concept. After this much preamble, introduced in order that some rather exceptional handling in the following pages may not seem wantonly bizarre, we can proceed with the main business in hand, which is to lay down a foundation for the psychology of knowledge.

Now, the one basal doctrine in this topic which can command universal assent is, that all knowing inevitably begins with sensory experience. Conformably, however, with our ideal of trying to agree about ideas and words before joining issue about facts, let us first of all inquire what "experience" is really intended to signify. Perhaps the readiest approach to an answer is by way of the dictionary. But for choice, let it not be a philosophical one, strained to fit certain favoured theories; more safely, we can consult one of the ordinary historical sort, that draws its definitions straight from the source, actual linguistic usage. In such a dictionary, experience may be found to have at least two meanings widely different from each other:

(a) knowledge derived from proof furnished by one's own senses; and

(b) something lived, undergone, enjoyed, or the like.

Which of these two shall we adopt?

At first sight there might be a partiality for the definition (a), on the ground of it according well with what the word means for the "plain man" when he talks—as he much likes to do—about "learning by experience." He firmly believes that by experience he becomes acquainted with material things, those for which he has, as he says, the evidence of his own senses. It is experience, according to him, that shows a tree to be green or a fire hot. A little more thought, however, is apt to breed serious doubts; eventually the question cannot but arise as to what sort of knowledge after all really is furnished by one's own senses.

The Physical World. But by this question we are straightway brought upon a fact which, save for people having become callous to it through life-long habituation, would certainly excite universal amazement. For, as depicted by all the natural sciences, including in particular for our purposes physics and physiology, the characters perceived by means of the senses, far from really being any part or parcel of the material things themselves, are not even directly connected with these. Thus, the apparent greenness of the tree depends, not really on the tree itself, but upon certain movements of quite another external thing, namely, the ether in contact with the perceiver's eyes. The matter of the external world—so the sciences unanimously teach—is really everywhere in a perpetual state of most violent commotion. It is as much so in the seemingly slumberous surface of a lake as in the storm-dashed foam of the ocean. Its minute particles possess, in addition to translatory movements at rates varying up to a mile or so per second, also vibratory movements which are transmitted to the ether and traverse this in waves two hundred thousand times faster still. These ether waves, then, are what—beating in upon the organism from every side—really " stimulate " it to visual perception. Similarly, if somewhat less tempestuously, other movements conducted by other external bodies become stimuli to the perception of sound, pressure, taste, smell, and so forth.

Nerves. Not yet, however, have we measured nearly the full distance between external objects as they seem to be " experienced," and as they really are constituted by verdict of the natural sciences. The chain of events must be prolonged by another and very different link, this time as prescribed by physiology. The physical stimuli hailing in upon a man are, in general, powerless to excite his cognitive processes until they first have succeeded in exciting his afferent nerves. And to do this they must impinge upon one of the particular places in his body which are furnished with sensory receptors. The waves of light find entrance

solely at the transparent aqueous and vitreous humours that afford them passage to the retina. The sound vibrations only become effective where they encounter the tympanic membrane and the ossicles that increase their force and carry them forward to the hair-cells on the lamina spiralis. Analogously, for the other senses.

The reception of the stimuli is made still more selective by the fact that even such as do arrive at the appropriate nerve are still unable to excite this unless their range happens to lie between certain definite and relatively narrow limits. For instance, the electro-magnetic waves commonly arriving at the retina vary in length from about .003 to .00007 mm. ; but only those are effective on consciousness which lie between about .0015 and .0008 mm. And these limits differ, too, for different persons ; stimuli that produce reds, or very deep tones, or very shrill ones, in the consciousness of some individuals, have no influence at all on that of others.

Far more important still than any such dependencies of the percept upon the nerve with regard to place of stimulation, or to limits in the range of effective stimuli, is the dependency which obtains with regard to quality of effect. This quality is not in the least governed, either by the nature of the original material thing or even that of the external event that stimulates the sensory nerve-tract. At bottom it is regulated solely by the nature of this tract itself. Let the stimulus be a mechanical pressure, or a chemical reaction, or an electric current, or an electro-magnetic wave ; in all cases alike, if only the kind of nerve remains constant, so also does the kind of sensation. For example, the visual percept arising when the retina happens to be excited by the ordinary ether waves possesses just the same qualities as that which arises when that same retine is excited instead by pressure.¹ In general, the message arriving from any

¹ This can readily be tested by the well-known phenomenon of " phosphenes." Close the eyes and turn them as far as possible leftwards. Then press on the outer corner of the right eyelid with the finger nail or the tip of a pen-holder. The result will be the perception of a bright circular segment of light on the *left* of the visual field.

particular nerve no more reveals the nature of its external source than the ring of an electric bell says who is pressing the button.

Inversely, let the physical stimulus abide perfectly constant. Still, so long as the kind of nerve varies, the kind of sensation will vary in corresponding manner. Thus, exactly the same physical event will produce, from the eyes a percept of redness, but from the skin a percept of warmth. The state of affairs is as if, in our illustration, one electric circuit—whoever might be pressing the button—inevitably rang a bell, whilst another no less fatally raised a lift, and a third had only the power to explode a mine. Could, by some surgical operation, the sensory nerves be detached from their present receptors and interchanged with one another, then a voice might be seen and a face heard, a toothache might be converted perceptually into a taste of chocolate, or the blow of a fist into the fragrance of jasmine.

Such dependence of the quality of the sensory percepts on the nerves stimulated rather than on the things stimulating applies, not only to external matter, but equally so to the perceiver's own body. His own movements engender certain agitations in and about the tendons, muscles, and joints, and these likewise give rise to percepts. Yet another group are originated—partly, at any rate—in the ampullar and vestibular chambers of the aural labyrinth. And even more vital are those which have their source in the digestive, circulatory, respiratory, secretory, and genital systems.¹ All these percepts alike show themselves to derive their characteristic qualities, not from the real nature of the stimulating bodily events, but from the nature of the nerves that the events may happen eventually to excite.

Nor is even this all. Up to now the divorce between

¹ Of all these physical stimulations and physiological receptive organs, a systematic account is given in most text books, either of physiology or of psychology. Especially recommendable from the former point of view are the *Physiologies* of Starling and Bayliss; from the latter standpoint, the *Experimental Psychology* of C. S. Myers. Both standpoints are well combined in the *Physiology of the Special Senses*, by M. Greenwood, Jr.

the material things and the mental percepts comes not altogether unexpectedly. The sensory qualities that we have been considering—visual, auditory, tactile, olfactory, gustatory, muscular, visceral, and so forth—are not characters to which modern physical science really lays claim. At its very start—with the Renaissance—it expressly discarded them (thereby returning to Democritus); it proceeded to treat as the sole real character of material things that of being extended in *space*; and it largely owed its brilliant success to so doing. Whenever a treatise on physics still mentions "colours" or "sounds," it does not mean the like-named sensory qualities, but only certain undulatory motions; and these have only spatial characters. The question must, then, be raised as to how far even the awareness of physical space is derived immediately from anything that can properly be called experience.

As regards things external to the body, at any rate, the answer in this case of spatiality must without doubt be as negative as it was above in the case of sensory quality. The fact of a man seeing a thing in any particular direction does not depend on whether it is there really, but on whether a particular set of retinal nerve-fibres is excited.

But as regards the body itself, and especially the nerves themselves, the view has been widely accepted that the power of cognizing space arises without any further mediatory process. Even Johannes Müller, who otherwise so strongly emphasized that the nerves are incapable of directly manifesting the qualities of physical matter, nevertheless still maintained that they

"reveal the extended character of space, because they are capable of exactly sensing their own extension."¹

And corroborative evidence would seem to have been afforded by the fact that, in respect of its spatial character, a sensory percept no longer exhibits dependence on the

¹ *Handbuch der Physiologie des Menschen*, 1834-40, bk. v.

nature of the nerve and independence of the real position, but reversely. A prick in one and the same point of a man's finger does not have for consciousness an unchanging apparent place ; instead, it presents itself as now high up and now low down, according to whether his material finger is really held high or low.

Upon closer investigation, however, the claim of the percept to be an immediate awareness of the real physical character fails apparently even here. For the correspondence between the two—not really more than approximate at the best—may upon crucial occasions altogether disappear. Thus, the stimulation of a nerve still seems to be located at its peripheral extremity, even when actually occurring anywhere else along the whole course of its axon. A familiar instance is the tingling which is localized by consciousness in the fingers, although its physical stimulation is situated at the point where the nerve passes behind the internal condyle (" funny bone "). Again, even when a limb has been amputated, a stimulation which really occurs at the stump has still the semblance of occurring at the extremity, although this no longer exists. Other gross errors of localization may be engendered in diverse manners.¹ The conclusion can scarcely be avoided that the real bodily place of stimulation does not after all govern the localizing in consciousness. On taking into account, not only the particular group of nerves excited by the external stimulus, but also all the other nerves (muscular, tendinal, or articular), excited by movements or postures, these nerves in conjunction appear to be the sole and complete determinants of the conscious localization. They determine it according to their rigidly fixed psycho-physiological properties rather than according to

¹ See the work of Brown-Sequard and those following his lines, especially the brilliant investigations of Head, Rivers, and others connected with them (*Brain*, 1905, 1906, and later). Several contributions have been attempted by the present writer, as " Analysis of ' Localization,' illustrated by a Brown-Sequard Case " (*Brit. Jour. Psych.* i. 1905) ; " Die Normal-täuschungen in der Lagewahrnehmung " (*Wundt's Psychologische Studien*, 1906, i.) ; " Fortschritte auf d. Gebiete d. Psychophysik d. räumlichen Vorstellungen " (*Archiv. d. g. Psychologie*, viii. 1906).

the real bodily place. Solely through such artificial mediation, then, is the physical space even of a person's own body ordinarily cognized, instead of—as it seems to be—through immediate experience. The nerves do *not*, at any rate in adult man, simply "sense their own extension."

Sensorium. The chain of events which thus parts the real material thing from the seemingly direct percept of it possesses yet another great link. The differentiating virtue which we have so far been attributing to the afferent peripheral nerves does not reside in their own intrinsic mode of functioning. Such peripheral nerves—as now commonly held by physiologists—function in almost, if not quite, the same manner; they transmit, namely, a bare "nervous impulse" from the one end to the other. Returning to our former simile, these nerves correspond only to the wires in the electric circuit, and not to the inserted apparatus whereby its results become differentiated into bell-ringing, lift-raising, mine-exploding, and so forth. Such differentiating neural apparatus has to be sought elsewhere; it must be looked for somewhere within that which with convenient indefiniteness has been called the "sensorium."¹ By this is meant that region of the brain which has the most direct connection with primitive sensory consciousness. In this same region, then, there also occurs the most mysterious of all transitions, namely, from the mere movement of physical matter to such an utterly disparate event as the awakening of mind.

Not only does the sensorium thus intervene subsequently to the peripheral nerve tracts, but it even acts independently of these. There does not exist one single sensory character, whether qualitative, spatial, or otherwise, but that the sensorium can evoke it in consciousness without any assistance at all from the sensory receptors, or even from the sensory nerves. This is manifested in the fact, that there

¹ The concept of a "sensorium," though nowadays not much in vogue, appears to be quite a legitimate one. It has such authoritative sponsors as Darwin, Lewes, and Carpenter.

is no kind of thing or event cognizable by actual seeing, hearing, touching, or other perception, that cannot equally well come to consciousness in dreams or in hallucinations. Indeed, this sensorium goes to the length of creating quite original percepts on its own account. Such, for instance, is blackness. In consciousness this may be a dominant feature, but in the physical things it has no existence whatever.

On the whole, then, that which "the plain man" takes to be his immediate experience of material things, that which he regards as the primary fount, the permanent authority, and perhaps even the sole legitimate extent, of all knowledge about them, all this has been receding farther and farther from genuine immediacy until it threatens to vanish altogether. Between the material thing and the perceptual experience there has intervened a long, complicated, and often loosely linked chain of events that are extremely unlike either the conscious percept at their near end or the material thing disappearing at the far end.

"Sensation." How by some means or other to recapture the absconding real material thing is, of course, the task of philosophy. And very various have been the paths of attempt.

The boldest and one of the earliest treatments of the problem was that of the Sophists, who drastically asserted that the things as they appear *are* the things as they really exist. This Alexander-like stroke, however, not only severs the knot, but in so doing mortally wounds reason. It asks for belief that the same wind can at the same time be warm and cold, the same stick straight and bent, the same object present and not present.

More widely convincing has been found the inverse solution, which maintains that the seemingly material objects are in truth only mental. Thus, Berkeley writes that they

"cannot exist otherwise than in a mind perceiving them. . . . When we do our utmost to conceive the

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existence of external objects, we are the while only contemplating our own ideas." ¹

We are thus brought back to the great doctrine of the Veil of Maya, according to which the supposed material things are no more than a universal illusion. They, the Many, are but the seeming. Truly existing is alone the All-one.

More recently a third answer to the riddle has been hazarded. There are those who would have us believe that the fact of the sensory percept being separated from the real thing by neural and physical events quite different from either, still fails to prove that these two, the percept and the thing, are different from one another. Somehow, it is pleaded, the chain of events may have been a closed one, so that the final link, the percept, more or less accurately coincides with the initial link, the real thing. But here we must at least make the comment that the perception, even if thus exactly congruent with the real thing, could not possibly be an immediate experience of it. Any such immediacy is already precluded by the mere fact of the intervening time. To take an extreme but fair case, the perception of a remote star cannot possibly be, or even contain, an *immediate experience* of that star; for its light must have taken thousands of years in travelling to us; indeed, the star itself may have long ceased to exist.

Now, to meet such difficulties, the plan usually adopted by psychology—and even by "common-sense" in its tolerant, all-embracing, but nothing-reconciling way—has been a recourse to the concept of "sensation." This latter has been taken to be that constituent of the perception which truly exists even when the thing seemingly perceived does not. For example, when a man has dreamt of seeing a red flag, he will readily concede that the flag itself did not exist in reality, but will yet maintain that the red "sensation" did so.

¹ *Principles of Human Knowledge*, xxiii. 1710.

In this way the term "sensation" deliberately renounces—and derives its plausibility from renouncing—all title to constitute any genuine knowledge of things external to the sensing person himself. It is taken, rather, as being some kind of *state*¹ into which the stimulus brings him. But by this conversion it becomes a sensory "experience" in the *second* of the definitions given previously (p. 36); that is to say, it is now conceived as something "lived, undergone, enjoyed, and the like." And, indeed, this second definition would appear to be, verbally also, much the more correct of the two; the Latin *experior* in this reference requires translating in some such manner as "I actually go through." The other definition (*i.e.* as knowledge) seems to have only arisen through popular confusion.

Primary Sentence. Shall, then, this way of conceiving sensation be accepted as in agreement with the real facts? Are we to believe that the effect of a sensory stimulation is truly the production of a mere mental state? To do so would assuredly be the simplest settlement of the whole problem. And it seems able to boast an immense weight of past authority, having been in some form or other accepted by the most diverse thinkers—a Democritus, a Plato, a Hume—and having subsequently been urged with notable force by Lotze. But on the other hand, the tide now looks as if it were at last turning. The doctrine that sensory percepts are at bottom mental states, far from being still accepted almost without question, is by many independent and vigorous modern philosophers no longer regarded as even deserving of respectful consideration.²

Now, to this modern tendency not a little may here be conceded. A visual percept, *as constituted under ordinary conditions*, certainly does not yield to unaided introspective

¹ The word "state" is not limited here to momentary affections, but includes also those which have any continuance.

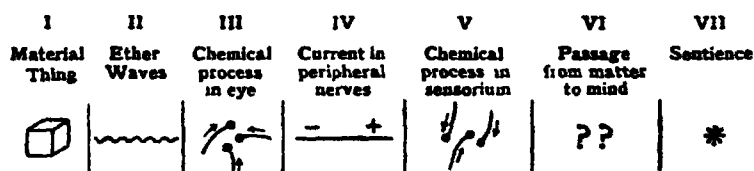
² See the important symposium of G. E. Moore, Johnson, Dawes Hicks, J. A. Smith, and Ward (*Proc. Arist. Soc.*, 1915-7). Noteworthy also is the "Psychological Explanation of the Development of the Perception of External Objects," by Joseph, *Mind*, xix. N.S., 1910, p. 469 ff.

analysis anything that can legitimately be called a mere state of the perceiver. It obstinately remains what must be called, rather, a percept, a presentatum. To name it lightly, as so many do, a sensation (or group of such) does violence to the facts, and may even be charged with making a false pretence of having discovered an explanation for these.

Nevertheless, over and above all such direct analysis of vision by means of introspecting it, there is yet to be reckoned with at least a possibility of analyzing by way of inference. And just this appears to have really been the standpoint at any rate of Plato and many others. Yet again, ordinary direct introspection itself, although not indeed able to effect the said analysis in the case of vision, may perhaps have such power for the less developed senses, particularly those of the viscera. Yet once more, and most decisive of all, there is a possibility that the power of introspectively analyzing even in the case of vision may be able to penetrate far deeper, when the ordinary casual conditions are replaced by some more searching procedure furnished experimentally.

Now, all these extensions of the analysis do, in good truth, as will be shown later on, converge to support the doctrine already ventured, rather hastily perhaps, by Plato and his school. According to the evidence which we shall produce, percepts, by the time they have become amenable to ordinary introspection, are already far removed from what is here mainly at issue, namely, the *initial* effect of sensory stimulation upon consciousness; they have already behind them an eventful history, not only on previous occasions in the person's life, but even on *the very occasion itself* (see Ch. XV.). In order to get back to the original conscious processes, we must employ all available means, including both inference and experiment. And on so doing, the primary effect of the sensory stimulation does appear, even in the case of vision, to consist in something that can fairly be called a mental state; it is an experience merely "lived" or "undergone."

Such, accordingly, is the view which we shall here adopt (pending our production of the promised evidence). An ordinary percept, especially if visual, will be regarded as including far more than any mere mental state. Instead of furnishing a starting point from which to explain the laws of cognition, it is something very complex, which needs such laws for its own explanation. Nevertheless, the initial (and for the most part unintrospectible) mental effect of sensory stimulation will be taken by us to be indeed sensation in the strict meaning of a state. But on being confined to this meaning—for which, perhaps, "sentience" is a better term—it evidently does not yet bring us within the domain of genuine cognition at all. So far, we stand only at the portals of our real quest. The whole march of events up to the present point resolves itself into the seven stages which are depicted symbolically below, and which end with nothing more than sentience experienced or "lived."



Incidentally, we may note that each of the stages III., IV. and V. is qualitatively quite independent of all the stages preceding it (pp. 38-42). Hence, the eventual effect of the material thing on consciousness is barred three times over from any likeness to that thing itself.

CHAPTER IV

FIRST PRINCIPLE, APPREHENSION OF EXPERIENCE

THE PRINCIPLE.

Statement. Formality of Laws.

RANGE OF "MATERIAL."

Sentience. Other Affections. Cognition. Conation. The *ego*.

CHARACTERISTICS OF "FORM."

Propositional Import. Belief and Insight. Coherence. Unit-processes.

CONTINGENCY.

NAMES.

"Noesis" "Noegenesis." "Apprehension."

THE PRINCIPLE

Statement. The preceding chapter has brought us only up to the level of "lived experience." In itself, this is no knowing; but it does supply a basis whence knowing can be immediately¹ derived, for here comes into play our first cognitive principle. This latter can, moreover, at once be so expressed as to include, besides the sensory kind of experience hitherto alone examined by us, a vast amount belonging to other kinds. It may provisionally be stated as follows. *Any lived experience tends to evoke immediately a knowing of its characters² and experienter.*

Formality of Laws. This and all laws, it may be at once remarked, are in outward expression no less "formal" than the mental faculties themselves (p. 4). But in the

¹ The word "immediately" means here the absence of any mediating process. It has no reference to succession in time.

² For the precise meaning of this word, see pp. 66-67.

case of the laws, unlike that of the faculties, the form implies, as inseparable from and homogeneous with itself, some sort or other of what may be called "material." Throughout, then, we must always bear in mind *both*. The "form" is, in fact, only the aggregate of those attributes of the occurrence which remain in all instances similar; whereas the "material" is composed of such attributes as may vary from one instance to another. Consider, for illustration, the first law of physics, "Every body perseveres in its state of rest or of uniform motion in a straight line." All instances of this are similar with respect to the bodiliness, perseverance, rest, and uniform motion, etc.; but they admit of diversity with respect to size, density, speed, and so forth. In the same manner, our first cognitive principle includes within its form whatever is always similar, such as the characters of immediate evocation, of knowing, and so on; whereas it has for material whatever can be diversified, such as the sentient or hedonic qualities and the individual experienter.

RANGE OF "MATERIAL"

Sentience. Let us, then, begin by examining more closely this material implied in our first principle; we will try to map out its entire possible range. The start may be made with that portion which has been indicated already, i.e. sensory states. Here, all the material accessible to knowing can be readily and trenchantly analyzed into four characters, viz. quality, intensity, spatiality, and temporality. All these and no others would seem to appertain, primarily at any rate (as mentioned at the close of last chapter), to states of sentience.

Considering these four characters more closely in turn, and commencing with *quality*, no fact or theory has ever been discovered to shake the division—familiar from the dawn of psychological history—into five great classes; these are of sight, sound, taste, and smell, together with a "tactile" class that has always been admitted to have a very mixed

constitution.¹ This last one is nowadays usually subdivided into pressure, warmth, cold, pain, kinaesthesia, and certain less definite sentient experiences attributable to the viscera. Physiologically, all the qualities are served by an enormous number of sensory nerves ; those for warmth have been calculated at 30,000 ; those for cold, at 250,000 ; for pressure, 550,000 ; for pain, 3,000,000. The estimate for sight has risen as high as six millions, but sometimes has fallen to a much lower figure.

The range of quality comprised inside of each of the foregoing classes is commonly taken to be measurable by the number of grades that can just be distinguished (under the most favourable conditions). There appears to exist only one grade for pressure, warmth, cold, and pain respectively ; only four for taste ; and perhaps a dozen or so for the visceral sensations. Smell, on the other hand, is credited with about 500 grades. Sound is divided into noise and tone, the grades of the former numbering some 600 ; those of the latter, no less than 10,000. Sight separates into chromatic and achromatic, the former having perhaps 200 grades, but the latter only two, namely, black and white. Thus, the grand total may be taken at roundly twelve thousand.

Passing on to the second general character, that of *intensity*, this also admits of being measured in range by means of the number of grades just distinguishable. The actual carrying out of such measurements has not, indeed, been very exhaustive hitherto ; but enough has been done to show that the range differs for different qualities ; thus, there appear to be about 700 distinguishable grades of brightness, but only about 100 of loudness.

As for the two remaining characters, those of *space* and *time*, their range of variation is for the present purposes sufficiently obvious. Such, then, is the entire gamut of sentient character.

Other Affections. In addition to all such states (or, as

¹ See Aristotle, *De Anima*, bk. ii. ch. xi.

they may also be called, "affections"), which derive from sensory stimulation immediately, there must also be taken into account, as further kinds of experience, those which have physiologically a more central origin. Here come the biologically and ethically cardinal hedonic affections, pleasure and unpleasure. Very important also are such affections as excitement and tranquillization, tension and relaxation; but about these the dubitable point arises, as to whether they cannot more appropriately be classified under the preceding section, that of sensory states (especially visceral).

Be this moot point of classification settled as it may, all such affections, whether hedonic, visceral, or otherwise, indisputably fall within the scope of our first principle; such experiences do beyond all question "tend to evoke immediately a knowing of their characters." The clearest cases of such direct apprehension of affective experience are given when this apprehending is conducted with deliberate purpose; it is then usually contrasted with the (immensely more complex) perceiving of external objects, and thus earns the title of "introspection." Venturing to quote work from our own laboratory, the following is a sample of the abundant records amassed by Dr. Wohlgemuth, the inducing experience being here the scent of heliotropine.

"Sensation, at first unpleasant. The Unpleasure persisted for a brief period at the same intensity. Then it increased suddenly. A moment later I detected a pleasure component in the sensation and for a brief period the pleasure and unpleasure distinctly co-existed. The unpleasure vanished from consciousness rather abruptly and for a short time the pleasure was very considerable. It seemed to me of an exciting character which was accompanied by fairly widespread organic sensations of a typical kind. I noticed particularly a slight catch in the breath which occurred at the moment of greatest pleasure. I think the sensations might be described as thrilling, or slightly vibratory, in character.

I think they are similar in kind to those that I have sometimes experienced during incipient erotic excitement. This high degree of pleasure persisted only for a very short time. The olfactory sensation itself became then much less pleasant and the organic sensations died down. . . . This disappearance was accompanied by some disappointment and discontent."¹

Cognition. This same record will also illustrate an additional class of cases falling within the domain of the first principle; by virtue of it, not only can the aforesaid affections be cognized, but so too can all cognitions themselves. Thus, either the just considered apprehension of experience, or any cognitive process deriving from the further principles to be considered later on, can itself be apprehended as an experience. The quoted experimental record abounds in such apprehensions as "I detected," "I noticed," "it seemed to me." Any active knowing process, no less than any passive feeling one, belongs to lived experience, so that it can equally well evoke an awareness of its own occurrence and character. Moreover, such experiential apprehension extends, not only to the characters of the cognitive process as such, but also to the (immanent) "object" cognized; I can know, not only *that* I know, but also *what* I know. (After this fashion, be it noted, the object is liable to be cognized in duplicate.)

Indeed, such a cognizing of cognition itself was already announced by Plato.² Aristotle likewise posited a separate power whereby, over and above actually seeing and hearing, the psyche becomes aware of doing so.³ Later authors, as Strato, Galen, Alexander of Aphrodisias, and in particular Plotinus,⁴ amplified the doctrine, designating the processes of cognizing one's own cognition by several specific names, as *συνειδήσις* and *παρακολούθησις*. Much later, especial stress was laid on this power of "reflection," as it was now

¹ *Brit. J. Psych.*, Mon. Suppl. vi. 1919. p. 55.

² See, for instance, *Philebus*, 60 D.

³ *De Somno*, 2, 455, 15.

⁴ *Enn.* iv. iii. 30.

called, by Locke.¹ For him, it was the second of the two great original sources of "ideas" (the other source being sensation). In recent times this ability to observe one's own cognitive operations of all sorts has supplied the instrument by which very bountiful harvests have been reaped experimentally, beginning with the great school of Külpe, and thence spreading to such work as that of Mischotte in Belgium, Bovet in Switzerland, T. Moore in the United States, and Aveling in Great Britain.

Conation. There remains yet another class of active experience; this consists in what is comprehensively called conation; it includes all phenomena of either appetite or aversion, all impulses, desires, or acts of will, and no less all consent, satisfaction, or dissatisfaction. The fact that this sort of experience, too, can come to awareness, and thus give rise to additional ideas, was expressly added by Locke. Its introspective apprehension has become one of the most prominent features of recent experimental work, notable in the hands of Ach. The following is a sample record from his investigations.

"After the experiment, a knowledge arose that the previous experiments had taken up a very long time. This thought became the motive to the energetic decision, 'I will say a rhyme as quickly as possible.'"²

In general, Ach concludes that,

"the act of willing as such is immediately given and well characterized: it must be claimed as a specific psychic experience."³

The "Ego." With the three preceding cases, affection (sensory and non-sensory), cognition, and conation, we have exhausted the whole scope of the experienced characters. Is this total, then, the *whole* of that which lies open to knowing by virtue of our first principle?

¹ *Human Understanding*, bk. ii. ch. vi.

² *Ueber den Willensakt u. das Temperament*, 1910, p. 219.

³ *Ibidem*, p. 247.

The reason for hesitating to agree is that, underlying all a man's apprehension of the characters of his experience, he certainly possesses also the idea of himself as being the experienter. Here may be quoted the forcible words of Lotze, sharply opposed though they may be to the current assertion that self-consciousness does not even begin until a comparatively advanced period of mental growth.

"Our ideas, our feelings, our efforts, are comprehensible to us only as states or energies of it (the *ego*), not as events floating unattached in a void."

Any psychology of cognition that fails to account for this universal apprehending of an *ego* must be disfigured by a gap so wide and deep as to render it impotent to explain thoroughly the simplest event in either ordinary life or experimental procedure. One particular case where such a psychology cannot but be helpless is when trying to unravel the processes involved in some of the most important mental tests.

Now, the simplest way to account for such a notion of an underlying *ego* is to derive it from our first principle, taking it to become known by direct apprehension in experience. And cogent corroborative evidence appears to be furnished experimentally. In our previous quotation, the record always runs, "*I detected a pleasure compound,*" "*It seemed to me of an exciting character,*" and so on. Ach, whose work is especially devoted to this matter, explicitly states that,

"As regards an energetic act of willing, it must be emphasized that the *ego* is always lived as the antecedent in this act; and indeed, with special impressiveness."

Opposed to this view, on the other hand, are only offered introspections carried out less scientifically, together with what must be regarded as no more than a *a priori* bias.

Pending, then, some much more plausible alternative explanation being proffered for the ubiquitous and indispensable notion of the *ego* than has ever been suggested

hitherto, we will here adopt the conservative attitude of attributing it to direct experiential apprehension. In other words, we accept the dictum of Ebbinghaus,

"Wherever thoughts and sensations are experienced, there also, immediately in them and permeating them, and in the same way as themselves, we are aware of a subject-carrier, to which they are attached."

This subject-carrier, *ego*, or experiencer, accordingly, we will add on to make up the grand total of all the items or "material" that can possibly be known by virtue of our first principle.

CHARACTERISTICS OF "FORM"

Let us turn to examine the chief characteristics of the "form" of such knowing. To a certain extent, this form is already implied in the very wording of the principle; but much else remains that requires careful examination in order to be rendered explicit.

Propositional Import. The first of these characteristics to be noticed here is that the end-state of the knowing, although in general dispensing with all use of language, nevertheless invariably has an import equivalent to a complete proposition. Thus, any of the preceding examples admits quite naturally of being thrown into an ordinary sentence: I am aware that "I am cold," that "I am pleased"; that "I want something." Nor would any radical change be made in this respect even if the *ego* were to be eliminated. There would then ensue such impersonal sentences as, "A coldness is going on," and so forth.

This characteristic propositional import, as may at once be added in anticipation, is fully shared by the two further principles that will follow.

Belief and Insight. In the case of all three principles, once again, the import is permeated by a constituent of vital importance for both theory and practice, namely, *belief*.

By this is not meant here the ancient *πίστις*, which was in particular an acceptance of anything as true without adequate rational grounds. Nor do we mean, as is sometimes done, an acceptance on the ground of testimony, or of reasoning. Our employment of the word is, rather, to denote quite generally the acceptance of anything as true, irrespective of the particular nature of the grounds for doing so.

But although belief taken in this highly abstract sense is all of the same kind, still the actual cases certainly seem to differ with respect to their validity. The Christian believes devoutly in his religion. The mathematician and the physicist believe in the correctness of their reasoning. The political reformer believes that his scheme for reconstructing society will really have some such beneficial result. His antagonist no less confidently believes that the scheme can only lead to Bolshevism, robbery, idleness, and ruin. Under hypnotic influence a person may be made to drink paraffin oil with a firm belief that it is the best brand of champagne. When suffering from mental disorder of certain kinds, a man may harbour an unshakable belief that all other men are persecuting him, that his bowels are made of glass, or that he is a millionaire as well as the Messiah, and the champion boxer to boot.

Owing to such undeniable differences in validity, almost every one at least admits that beliefs—even apart from whether they happen to be true or not—differ as to the adequacy of the evidence upon which they are entertained. This distinction is rendered with admirable clearness in the following Platonic dialogue : ¹

" *Socrates* Whether, therefore, does it appear to you, that . . . arriving at knowledge (*μάθησις*) and belief (*πίστις*) are the same or different ?

Gorgias. I think, Socrates, that they are different.

¹ *Gorgias*, 454 D.

Socr. Yet both those who arrive at knowing are persuaded, and those who (only) believe.

Gorg. Such is the case.

Socr. Are you willing, therefore, that we lay down two kinds of persuasion, one that produces belief without knowledge ; but the other, science (*ἐπιστήμη*) ?

Gorg. Certainly."

Now, the immediate scope of all our three principles extends solely to the kind of "persuasion" which is capable of producing "science"; in other words, it includes only such beliefs as rest upon adequate evidence. This whole matter of evidence, indeed, is one which many writers have tried to eliminate from psychology altogether, reserving it for the purview of philosophy. But to treat psychology in this manner is really to lop off one of its limbs, namely, all in it that concerns error, fallacy, suggestion, and the like. Moreover, in point of fact, the actual drawing of the distinction between adequate and inadequate evidence is in almost all simple cases comparatively easy. Everyone must agree that any normal man is quite competent, without instruction and solely from his own inward illumination, to know upon occasion that he is pleased, or that he thinks, or that he is moved by desire. The intervention of inadequate grounds for belief, although undeniably frequent, is still by no means the general case. Nor does it, like the awareness on grounds that are adequate, belong to the rock-bottom of all psychology, and therefore offer no possibility of further psychological explanation. On the contrary, it must derive from, and hence need explaining by, some or other special circumstances.

It is possible (but not for the present purposes indispensable) to go still further and to maintain that belief thus based upon adequate evidence can possess a peculiar characteristic actually present in consciousness at the time which may be called "insight"; this, in other words, is evidence *known as such*. To illustrate this, let a person's awareness that he is enjoying himself be compared with his belief that

all men must die. As regards degree of certitude at the moment of believing, the second case may be scarcely inferior to the first. But as regards evidence, the awareness of the enjoyment reveals itself in consciousness as having a self-sufficient basis in the actually experienced enjoyment itself. The awareness of inevitable human mortality exhibits no such insightful origin. To detect adequate grounds for it, there is need of a more or less strenuous search—which may perhaps not even be finally successful.

Coherence. The next characteristic to be noticed in the manifestations of the first cognitive principle is what may be called the "coherence" between all constituents. When aware that "I am cold," the awareness is not, like the words expressing it, split up into three portions isolated from one another. Still less is there any isolated occurrence of the belief or the insight. Instead, all the constituents are, so to speak, cemented together. "Coherence" in this sense is a concept well understood even in popular usage. It may be illustrated by contrast with the *incoherence* (apparent, at least) of a letter written by a maniac and consisting of words in a mere string: "Mediterranean, horses, anathematized, Athanasius, propagated, emphatic, monasteries, . . ." ¹ To enter into the nice problems raised by this characteristic of coherence would be a disturbing digression; but something more will have to be said on the matter in a subsequent chapter.

Unit-processes. The foregoing considerations concerning the form in which our first principle manifests itself show clearly enough that such form has the further characteristic of constituting a cognitive "process," as it has already been designated by us. For this word means any continuous series of changing states or actions. Thus, in the case of the principle, there is a change of cognition from the state of ignorance to that of knowing.

Furthermore, this process is such as to fall into distinct *units*; for each has the same perfectly definite starting point,

¹ Clouston, *Mental Diseases*, 1898, p. 166.

that of zero ; and each has also the same definite end-state, namely, the highly complex constitution which we have just been examining, that of a coherent, believed, self-evident proposition.

Such a splitting up into separate units in the case of the cognitive principles may be contrasted with the manifestations of the first and second principles of physics ; in these, there is no definite either beginning or end. Somewhat more analogous, perhaps, is the third physical principle, " To every action there is an equal and contrary reaction." But far the closest analogy holds with the processes of physiological growth ; the forming of each organic cell, like each apprehending of an experience, is a separate development of an entity with uniform and highly complex constitution.

As we shall presently see, not only the first but also our other two cognitive principles are characterized by this same moulding into propositional form, and consequently by the same dividing up into unit-processes. These latter would appear destined to play in psychology as paramount a part as do the cell-formings in modern physiology. Whenever the make-up of any cognitive operation has to be analyzed, this is best done by resolving it into the unit-processes as its basal constituents. Whenever any test of individual ability has to be constructed, its diagnostic success will depend, not only upon the nature, but even upon the number, of the unit-processes of which it is compounded. For instance, a test of " general intelligence " might well require (according to the results of the present writer) some two hundred ; and this amount could be introduced effectively in from half to three-quarters of an hour. Psychology, to obtain the much fuller measure of success awaiting it, must evolve towards a mental cytology.

CONTINGENCY

The next question—and a hard one, indeed—is as to whether this first cognitive principle becomes realized always and inevitably, or only sometimes and contingently.

In other words, are to undergo an experience and to know it inseparable aspects of the same process; or are they *two* processes, so that possibly the undergoing can occur *without* the knowing?

This belongs to those great problems which have divided psychologists into two camps from the earliest days. Plato appears to have sided with the view that cognition is contingent only and can upon occasion fail to occur.¹ Plotinus,² and borrowing from him, Leibniz,³ advocated this emphatically. Since then it would seem to have been much more often held than not, especially conspicuous among its defenders being Kant, Schopenhauer, Hartmann, and Hamilton.⁴ During the last few years an enthusiastic support for it has been brought by Freud and his followers. But on the other side also there have explicitly ranged themselves numerous eminent authorities, from Descartes and Locke onwards—not to mention a host of further writers who have tacitly rejected the possibility of uncognized experience inasmuch as they have ignored it.

The present work for its part has been obliged by the facts to join the banner of Plato and Plotinus, as may straightway be seen in the very statement of the principle, since here the coming of experience to awareness is described as no more than a "tendency." Some of the reasons that have made this standpoint appear preferable will be brought forward later on (Ch. XI.).

NAMES

The last point to be considered in this chapter is the very tiresome one of names. The present work suffers in unusual degree from not finding any current names that will properly fit some of the ideas necessarily employed. Hereupon

¹ *Theæt.* 185 D; *Phileb.*, 21 B, 24 A; *Resp.*, 508 D. ² *Enneads*, iv. 3, 30.

³ *Nouveaux Essais*, ii. 1. 1.

⁴ See, for example, the use of it formerly by Cudworth, in modern times by Hamilton and Stout.

an unpleasant dilemma arises : either some name already current must be constrained to serve in a more or less novel signification, with imminent danger of breeding fallacies and misunderstandings ; or else new names must be invented with a certainty of their bringing trouble and dislike.

"Noesis." The first case of this kind here is the need of some word to designate characteristically and generically all our three principles in all their manifestations. For this purpose, it is natural to select the vital property which all these manifestations possess in common of being self-evident. But to designate this property, the writer has been unable to find any term better than "noetic," which is no doubt of very old and good repute, but, on the other hand, seems never previously to have been used in any meaning nearly so broad as required now.¹

"Noogenesis." Another basal property of the manifestations of all the principles is that they, and they alone, are generative of new items in the field of cognition. If, then, it be desired to depict these three principles summarily, taking into account both their noetic and their generative properties, we must compound some such name as "noegenetic."

"Apprehension." There still remains to find a specific name for the manifestations of this first principle as distinguished from the other two (yet to be considered). In this case, just what is required *has* existed, namely, the ancient *συνείδησις* or the *παρικολούθησις*. But to attempt to introduce nowadays "syneidesis" and "syneidetic" seems too venturesome. Another quite satisfactory name could be found even in very familiar current terminology, if only there could be restored the meaning it possessed before its shallow treatment by the associationists had contaminated it ; this is the word "consciousness," which originally seems to have been a straightforward translation of the above-

¹ See, for instance, the usage of it formerly by Cudworth, and recently by Hamilton, Stout with many others.

mentioned Greek words.¹ Since, however, any return to the clearer terminology of earlier days has now become hopeless, we will content ourselves with using the cumbersome but fairly definite phrase "experiential apprehension," shortening this wherever feasible into simply "apprehension."

¹ See ch. xi.

CHAPTER V

SECOND PRINCIPLE, EDUCTION OF RELATIONS

THE PRINCIPLE.

RANGE OF FUNDAMENTS.

Characters of Experience. Relations themselves. Products of Third Principle.

RANGE OF RELATIONS.

Definition and Place in Cosmos. "Real" Relations (Attribution, Identity, Space, Time, Cause, Objectivity, Constitution). "Ideal" Relations (Likeness, Evidence, Conjunction). Intermixture.

COMPARISON WITH FIRST PRINCIPLE.

General Parallelism. Three Members. Genuine and Seeming Fundaments. "Eduction."

THE PRINCIPLE

HOWEVER faultily any writers may have portrayed in detail the kind of cognitive growth just considered by us and springing immediately from lived experience, no one at least has ever failed to realize its immense importance in general. But as for further cognitive growth attained in different manner, this has often been extraordinarily neglected, sometimes even altogether overlooked, and perhaps not ever brought to definite and complete expression. And yet its importance is hardly smaller. The growth started by virtue of the first principle is capable of infinite augmentation by that of a *second*. This may be formulated as follows: *The mentally presenting of any two or more characters (simple or complex) tends to evoke immediately a knowing of relation between them.*

The whole process is depicted in the following diagram, where *A* and *B* stand for two initially presented characters,

whilst *C* symbolizes the relation tending to become known between the one and the other.



FIG. 2.

Among the simplest examples of this process are ordinary tests of sensory discrimination. Here, the person tested has two distinct tasks : first, the initial apprehending of the respective characters of the two sensations ; and then, the cognizing of a relation of likeness or difference between these characters.

In the latter task, as in all the cases coming under this second principle, the data which initiate the process no longer consist of experiences blindly lived, but of characters already in some way or other presented cognitively. But, on the other hand, now mere presentation in mind is quite sufficient ; the characters do *not* need be known on evidence, experiential or otherwise ; they are not necessarily believed at all. Though the presented objects may happen to be the wildest imaginative monstrosities, still relations can be cognized between them. A griffin can be clearly known to be different from a unicorn, in spite of neither the one nor the other having really existed at any time.

RANGE OF FUNDAMENTS

In accordance with ancient usage, the items that bear any relation to each other will here be called its "fundaments." These, together with the relations themselves, constitute the whole "material" over which the second principle has its sway (p. 49). What, then, is the total range of these fundaments ? Obviously, one supply of such material for the manifestation of the second principle is given in the products of the first ; that is to say, relations can be cognized between any characters whatever, simple or complex, concrete or

abstract, that have come to apprehension within any experience. This can take place indifferently as to whether the said apprehended experiences consist in, or are any constituents of, either an affection (sensory or non-sensory), or a cognition, or a conation.

Relations themselves. But this is not the sole way in which fundamentals can be supplied. Any relations, once apprehended, may afterwards themselves act as fundamentals; they may go on to evoke awareness of relations *between each other*. In a test of musical ability, *e.g.* two pairs of tones might be sounded, the one presenting an interval of a third and the other of a fourth. The testee might have to decide whether these sounded intervals are the same or different. The original awareness of each interval is already one of a relation, so that the final awareness demanded is one of a relation between relations. The number of levels to which such building up can ultimately ascend has no final limit. The same sphere whence we have just taken an example, that of music, presents levels piled on one another to an astonishing altitude.

Products of Third Principle. Even this does not exhaust the whole possible range of the fundamentals that can evoke awareness of their inter-relations. The present chapter only brings us up to the second cognitive principle, and there is still a third to come later on (Ch. VII.). The products of this also can quite well serve as fundamentals between which to cognize relations in similar fashion.

RANGE OF RELATIONS

Having thus outlined the total range of the fundamentals by which the processes of the second principle are initiated we may next try to delimit that of the relations in which they terminate, and thus sum up their "material" altogether.

Definition and Place in Cosmos. To begin with, however, let us settle carefully what the word "relation" is intended to

signify. Employing the classical rule of proximate genus and specific difference, a relation may be simply defined as any *attribute which mediates between two or more fundamentals*.

Herewith its general sphere is at once marked out in the entire cosmos as cognized, and therefore in all cognition itself. For this cosmos of ours would appear to be constructed upon a peculiar plan. The bottommost layer of it consists of metaphysical "substances," partly psychic, as one's own self and other selves, and partly physical, as the stocks and stones around us. Upon these are superposed "attributes," and of two kinds. The one kind inheres in the substances and may be called their "characters";¹ thus, "happy" is a character of a person, as "extension" is of a tree. The other kind mediates between two or more substances, and consists of the just mentioned "relations," as when one person thinks of another, or two trees stand side by side.

Into this so far simple plan, however, there is introduced an interminable complication by the fact that all the original attributes of the substances can themselves have further attributes of higher order; and these again, others of higher order still, and so on in infinite ascent. This, moreover, applies to attributes of both sorts, either characters or relations. For instance, as regards the former, "colour" is a character of an extended surface, but "red" is one of a colour, and again "intense" is one of "red." As regards the relations, analogously, two similarities may be similar to (or different from) each other. Yet more, *even a relation has some character*; thus, a relation of difference has at any rate the character of being one of difference. Analogously, it is a truth—and something more than a mere tautology—to say that any character has the character of being such a

¹ The sense of this word is perhaps best elucidated, as above, by contrast with that of relation. It includes all attributes that do *not* mediate between two or more fundamentals. Its two main divisions are quality and quantity. With us the word will not, as sometimes happens, carry any special connotation of compositeness.

The further term "characteristic," it may be added, signifies any character which distinguishes its fundament from everything else.

character. The word "fundament" is only the obverse to attribute; thus, the fact of X being an attribute of Y is exactly equivalent to that of Y being a fundament of X .¹

The foregoing observations are not, we must emphatically observe, any attempt to depict the cosmos truly, but rather to delineate the boundaries within which all depicture of it, whether true or false, would appear to be rigorously confined. It seeks to map out the gross product—thus including alike truth, error, and fiction—of all human cognitive operations whatsoever. It indicates, consequently, the material with which alone the psychology of cognition has to deal. On psychology falls, indeed (or should fall) the task of showing in general how such operations become adulterated with error. But it is by no means charged with the task of systematically eliminating the adulterations, so as to refine out the pure residuum. This is the work, rather, of epistemology.

"Real" Relations. The next step towards clearing up the topic of relations would naturally be to marshal those that are elementary into some radical and comprehensive classification. But this has shown itself historically to be an achievement beset with most formidable dangers. Psychology has treated the whole topic with lamentable neglect. Even the attempts made by philosophy have been far from commendable: the classes usually proposed suffer from faults

¹ Characters themselves may be divided into two classes. The one consists of those which are essential and necessary to the entity; these may be said to constitute its "essence" or "nature"; e.g. spatiality in general belongs to the very nature of a physical body. The other class consists of those characters of the entity which are more or less accidental to it, and may be termed merely its "modes"; e.g. any *particular* position in space is only a mode of a physical body, since this latter may at any moment take up a different position. Such distinction of accidental mode from essential nature, however, disappears in a certain sense on turning from the domain of real to that of ideal existence; the character of an idea as such is *always* its essence and nature; thus, the bare idea of a "triangle" contains nothing more than what such a shape by its very nature is.

Owing to this fact and to our being concerned with ideal rather than real characters, the word "character," although being taken by us in a much more general meaning than essence or nature, will nevertheless be practically applied to the same range of cases.

of every sort, as overlapping, omission, and insignificance. In order to meet our most pressing needs and build an approach towards urgent practical problems (such as those of mental measurement, training, and so forth), we must venture to make some outline for ourselves that will at any rate serve our own purposes tolerably.

An insidious fallacy lurks in the fact that the classifying can be done along either of two different lines. It can follow the nature of the relations themselves, or else that of their fundaments. These two lines correspond sufficiently to engender confusion between them, but diverge enough to make such confusion mischievous.

Keeping, then, to the nature of the relations themselves, the broadest line of division—more interesting for philosophy than psychology—is that which separates those called "real" from those which are only "rational" or "ideal." These last two alternative names indicate rival doctrines which have widely and strenuously fought with one another for many centuries, and which have now abated their combat, not so much from victory on either side, as rather from supervening lassitude on both sides. The term "rational" was meant to imply that this kind of relation has no existence in the related things themselves, but only springs from particular cognitive operations upon them. The expression "ideal," on the other hand, signifies that such relations do have an existence in the related things, but one of different order from that of reality, namely, that of "ideality." In this great war we happily have no need to intervene.¹

Attribution. Commencing with the "real" relations, then, the class of these that pervades most generally the entire apprehended cosmos derives at once from the above-mentioned basal categories of fundament, character, and relation itself. This primordial class may, perhaps, for want of a better name, be called that of *attribution*. It includes,

¹ During the last few years the old struggle seems to be flickering up again in the writings of Bradley, Bosanquet, S. Alexander, G. E. Moore, Dawes Hicks and others.

for instance, the relation of a character to its fundament, as of redness to the thing which is red. Another instance is the relation born by any relation itself to either of the things related, as that of fatherhood to father.

A due appreciation of the process of cognizing this class is especially needed for the psychological study of language (see Ch. IX.). The process also plays the leading part in such mental tests as that of Analogies. Thus, one of these (used by the present writer in an entrance examination for adults) contained the instruction to fill in the last word of the following incomplete sentence by one of the four words beneath it :

“ WARMTH is to STOVE as SHARPNESS is to . . . ”
 fireplace tool heat cut

In order to answer correctly, the person tested has to perceive that the relation of warmth to stove is the attributive one, and that such also holds between sharpness and tool. Persons of inferior ability (as measured by independent means) were sometimes found to respond, instead, with “ cut.”

Identity. Our second class of relations is that of *identity*.¹ This supplements the foregoing relations of attribution. For in the cosmos (as cognized) a fundament can remain identical with what it was before in spite of any of its characters giving place to others.² Thus, a physical body is taken to be still the same body when put into a new position ; a surface is still the same surface though its colour becomes different ; even the colour itself is often regarded as persisting despite change of brightness. The instance supremely interesting for psychology is the persistent identity believed by some, but not by others, to appertain to the *ego*.³ A widely different instance of this relation of identity is given in that two or more thoughts can be of the same thing.

¹ Some authors deny that identity is any relation at all. Others would regard it as only the limiting case of extreme likeness. Into these controversies, we cannot enter here.

² See footnote to page 67.

³ See p. 53.

Time. The third class is furnished by *time*. This is one of the cases where, particularly, the class of the relation itself has to be distinguished from that of the related fundamentals. When one period of time occurs subsequently to another, both the relation involved (that of sequence) and also the fundamentals are of the temporal class; but when one period equals another, only the fundamentals are so, the relation now no longer being of time, but of likeness.

With these relations of time, it may be remarked, a region is entered which has already long been subdued to the methods of the psychological laboratory (foremost, as usual, having been that of Wundt). It contrasts in this respect with the two preceding classes of relation; for with these, notwithstanding that they also offer a wide scope for scientific handling, such has as yet hardly begun.

Space. Much the same may be said with respect to the fourth class, that of *space*. For here, too, the fact of the fundamentals being spatial does not at all necessitate the relation being so. And here, even more than in the case of time, the aid of experimental research has been invoked with prolific success. Among the conspicuous instances have been the construction of many tests of geometrical, motor, and mechanical ability.¹

Cause. The fifth class, however, that which comprises the relations of *cause*, has as yet scarcely emerged from the stage of unfruitful speculative controversy. Even its sphere of existence is vehemently disputed. Some writers would restrict it to matter alone; others, to mind; yet others have allowed it to both; and still others, to neither. As for genuine research into the process of cognizing it, of this not even a commencement has been made. Yet such cognition possesses for psychology the greatest practical importance, as will be illustrated later on.

Objectivity. For a sixth class, we may take those particularly difficult relations which derive from, or are essentially

¹ The standard work for these and others is the *Manual of Mental and Physical Tests* by Whipple.

superposed upon, mental *objectivity*. The simplest of these consists only in the basal relation that holds between any object as mentally presented and the process of mentally presenting it; such, for instance, as the relation of a sight to a seeing, or of a sound to a hearing; one ancient name for it is "in-existence." Another group brings in the superposed conative processes; a pre-eminent instance is the relation of "purpose" between any presented event and the willing that this should actually occur. A third group introduces valuation; the presented items are submitted to the relation of being approved or disapproved. Here, once again, the task of investigating by experimental or other scientific methods as to how, and under what conditions, and by whom, such relations come to awareness, has been hitherto—despite its evident immense importance—almost wholly neglected.

Constitution. Yet another type of relation must be cited here, one whose very ubiquitousness renders it liable to escape observation. It may best, perhaps, be called "*constitutive*." Let any two items of awareness be symbolized by the letters X and Y ; any relation that holds between them, by r ; and all three cohering together, by the bracketed (X, r, Y) . We can then, with linguistic appropriateness, say that X , r , and Y are "constituents" of (X, r, Y) . In other words, X , r , and Y bear to (X, r, Y) a relation which may be called that of constitution.¹

"Ideal" Relations. Let us now pass over to the other great division of relations, namely, those which have been designated as only "ideal." Of these the first class is that of *likeness*, including the opposite of this as well as all possible varieties and degrees. The process of cognizing these relations permeates awareness of every kind. It furnishes the main resource of all sorts of mental tests, whether sensory or otherwise. Few events are more curious in the history of psychology than that such an extremely obvious form of cognition could ever—owing to theoretical bias

¹ See ch. viii.

—have been wholly ignored, as done by the associationist school.

Evidence. The second class of these ideal relations consists in those of *evidence*. To urge that these are profoundly different from those of likeness might well seem to be superfluous, did not history show that even authors of the calibre of Locke and Bain—to the grave hindrance of psychology—came near to confounding them together, in that they labelled both as "agreement."

At the other extreme from such a tendency to deny to the evidential relations any specific nature of their own has been the still more frequent inclination to exalt unduly the cognizing of them: such cognitive operations have been set up on a pedestal as appertaining to the higher power of "reasoning." In so doing the distinction fails to be made between cognizing the relation *of* evidence and cognizing relations *by* evidence. Only the former of these two specially belongs to reasoning. The latter and far more important of them inheres in the cognizing of relations of all kinds whatsoever (see pp. 55-58).

Conjunction. To the preceding classes it appears needful to add still the relation of *conjunction*. For although all relations of any kind are in some measure conjunctive, yet conjunction can be apprehended apart from any of the others. Indeed, such naked conjunction, poverty-stricken though it might seem to be, is nevertheless very precious. Taken together with its obverse aspect of division, as also its special case of ordination, and further elaborated by other relations, it supplies the whole basis of arithmetic (including of course, algebra) and half that of geometry (the other half deriving from space).

Intermixture. However sharply the ten preceding classes of relation may be distinguishable in themselves, this does not preclude the respective cognitions of them from being very intimately and often perplexingly intertwined with one another.

A tangle of this sort, peculiarly hard to tease out, is

afforded by arithmetic, in spite of its being originally based on the bare conjunctive relation. This latter by itself can lead no further than to the concept of "sum." Not until the items are also apprehended in the relation of likeness does mere sum develop into the mathematically foundational concept of "quantity."¹ Then, as soon as the concept of quantity comes to be elaborated, and, in particular, "units" need being introduced, the relation of likeness has to be reintroduced on a new and higher level, in the guise of "equality." And from this must be carefully distinguished the additional development due to the constitutive relation; to say that one and one are equal to two is by no means the same as to say that they constitute two.

Even all this much intermixture is insufficient for arithmetic. Between the different cases of likeness a mediating bridge has to be constructed with relations which are neither of conjunction, nor of likeness, nor of constitution, but belong to the evidential class. Of these they make a special variety coordinate and confusingly analogous to those of formal logic. Consider, for example, the following standard logical syllogism (in "Barbara"), wherein each proposition may be regarded as asserting a relation of identity:

" Since all *M* is *P*,
and all *S* is *M*, } therefore all *S* is *P*."

With this compare the following mathematical argument, wherein each proposition enounces, instead, a relation of likeness:

" Since all *Y* is greater than *Z*,
and all *X* than *Y*, } therefore all *X* than *Z*.²

Finally, it should be noticed that the ideal relations can be applied, not only to ideal, but also to real fundamentals.

¹ This is obvious in the case of both number and extent. The case of intensity is more complex, but would appear to be at bottom similar.

² This latter inference, although outwardly so similar to the syllogistic one, nevertheless, on the attempt being made to express it in purely syllogistic form, discloses itself not even to fulfil the cardinal syllogistic condition of possessing only three terms.

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Thus, from knowing in general that the propositions *M-is-P* and *S-is-M* taken together prove the proposition *S-is-P*, there is an immediate passage to knowing in particular that *this-M-being-P* and *this-S-being-M* taken together prove *this-S-is-P*.

COMPARISON WITH FIRST PRINCIPLE

After this brief but comprehensive survey of all the "material" (fundaments and relations) capable of entering into the manifestations of the second principle, let us now proceed to examine these manifestations in respect of "form," comparing them particularly with those of the first principle.

General Parallelism. To a large extent, the chief features run in the two cases almost exactly parallel. Thus, both manifestations alike take the form of coherent, self-evident propositions. Both alike, consequently, fall into so many distinct unit-processes; and both may be called "noetic." *E.g.*, the first principle leads to the complexly constituted and cleanly rounded off awareness, "I-see-red"; the second leads to "red and blue are different." So also, they are both generative of new mental content; for as new content must be regarded the "different" no less than the "red" or the "I." Putting the noetic and generating properties together, the second principle, equally with the first, finds its most essential characterization in the compound name of "noegenetic." Finally, both processes alike are not necessary, but only contingent; the becoming aware of relations between characters, just as the apprehension of lived experiences, does not occur unless the conditions are sufficiently favourable. This fact is especially obvious in the case of tests of discrimination; for the very purpose of these is to ascertain which persons can and which cannot cognize the relations of resemblance and difference.

Three Members. Turning, next, to some respects in which the two processes do present important divergencies from each other, a notable feature in those derived from the second

principle is that they possess three functionally distinct main members, viz., the two fundamentals and the relation.¹ A similar triplicity of members can, indeed, be asserted in the case of the first principle also ; for here, the process can be split up into the experiencer, the character experienced, and between the one and the other the relation of experience. With regard to this last analysis, however (besides its approaching dangerously near to rocks of controversy), the said three members do not exercise any separate functions, but come and go in block. With regard to the second principle, on the contrary, two of the members, namely, the fundamentals, play each a distinct and mutually supplementary part ; and as for the third member, the relation, this is still more distinct in function from both the fundamentals, seeing that it is not, as they are, generative, but instead generated.

This triple membership, indubitable as it here appears to be, nevertheless sharply conflicts with the very foundations commonly laid down for several great branches of learning. To recognize this triplicity, then, threatens such branches with need of basal reconstruction. Take, for instance, logic. This is everywhere justifiably enough admitted to be founded on propositions. But then these latter are quite incorrectly almost always treated as possessing only *two* members (besides the mere copula), namely, the so-called subject and predicate. A restoration of the unjustly excluded third member might well lead to momentous changes. Another prominent instance is that of philology, where the present basis, consisting as it does of two-membered propositions, needs an amendment that also might be fraught with revolutionary issues (see ch. viii).

Genuine and Seeming Fundamentals. There is a curious way in which one of the two principles here under comparison can perturb the manifestations of the other. By virtue of the first principle, as we have seen, any knowing can be

¹ Each of these three members, like the whole process, or like its whole result, can for some purposes be conveniently taken as units. They are such, e.g., in the sum total of mental contents.

followed by an apprehension of this knowing. Now, nothing prevents the original knowing from being executed clearly but the superposed apprehension confusedly. In the original knowing, accordingly, the fundamentals may be definite enough to evoke a very accurate awareness of their inter-relation; and yet in the superposed apprehension of this knowing, these very same fundamentals may be confused with other items. And this, in point of fact, is what most commonly happens. Consider, for example, the case of two tones being perceived to have the relation of harmony. This relation can easily be supposed to hold between the two entire tones. Yet to suppose this is to include as portions of the fundamentals the tonal characters of loudness, timbre, duration, etc., which are in truth irrelevant to the harmony. The sole tonal characters genuinely harmonical are those of pitch.

This fact, that when relations come to awareness their fundamentals may be apprehended as such very confusedly, has many a momentous bearing. To nothing else than an elimination of such confusion should be ascribed much that is currently called abstraction. Turning to a more popular instance, the liability of the seeming fundamentals to be other than the real ones may account for the well-known advice of an old judge to a young colleague: "Give your conclusions confidently, for they are almost sure to be right. But where possible avoid giving your reasons, for these will probably be wrong."¹

"**Education.**" There remains still the most profound of all the characterizations of the second principle as compared with the first. This further difference consists in the fact (already indicated on p. 64), that here the knowledge has an immediate source other than lived experience. Let any person have any sort of presentation of any two cognitive items whatever, whether their actual existence is possible or impossible; let these items even be, *e.g.*, the concepts of

¹ For some illuminating remarks on this point, see the work of Elliot-Smith and Pear on *Shellshock*, 1917, p. 59.

"possible" and "impossible" themselves. On understanding what these two words respectively mean, he will at least be able to say the meanings have the relation of difference. And in order to obtain such knowledge, he does not need—he is even unable to possess—any actual experience of these items. He can, so to speak, immediately *educer* the relation from their very characters as presented.¹

If more elaborate instances be required, they may be readily taken from mathematics. Those who are familiar with this science know well how one can lie for hours with closed eyes educating relation after relation between algebraic magnitudes that certainly neither are nor even ever have been given immediately in his lived experience.

This word "*educer*," then, we will choose for the purpose of distinguishing the manifestations of the second principle (as also of the third) from those of the first; in this way, "*education*" will be opposed to "*apprehension*."

¹ A nice point, in which we cannot here attempt to enter profoundly, is whether *all* relations come to awareness by way of education from the respective characters of their fundamentals. The alternative view would be that occasionally some relations may, like their fundamentals themselves, be apprehended directly in lived experience. An instance plausibly supporting this view is the already quoted experiential apprehension, "I-see-red." The relation of "*seeing*" may be regarded as *not* educible from the intrinsic characters of the "*I*" and the "*red*," but only observable in actual occurrence.

CHAPTER VI

VARIETIES OF RELATION-EDUCING

SOME SPECIAL VARIETIES.

Perception and Thought. Multiplicity of Elements. Changeling Basis.

“JUDGMENT.”

Comparison. Opinion. Endorsement. Volitional Component. Conclusion.

SOME SPECIAL VARIETIES

IN the previous chapter we examined those features in the process of educating relations that characterize it universally. We may now turn to certain other features which distinguish important special varieties.

Perception and Thought. The first of these distinctions is a profound gulf which has from the most ancient time been declared to lie between sensory perception and abstract thinking. This attitude was adopted as emphatically by the champions of the one achievement as by those of the other. On behalf of the sensory perception was claimed the virtue of prior, or even of sole, genuine validity. For the thinking, the counter-claim was raised that this appertains to the alone infallible power of “intellect” or “reason.”

By our first principle, however, the trenchant line dividing up cognition has now been drawn elsewhere. It no longer marks off any distinct sphere of sense-perception, but one of experience-apprehension, a very different feat. As for the other or classical division, namely, between perceiving and thinking, this from the standpoint of the second principle will still be admitted to exist, and even to have great significance ; nevertheless, as the following considerations indicate,

it can no longer be acknowledged to effect any sharp cut, but only a gradual transition.

One of the ways in which a smooth passage begins from mere perception towards what deserves to be called thought is by building upon the original sensory basis further (mostly relational) knowing of greater and greater complexity. Take, for example, the Maze test, where a person is faced with lines, turns, gaps, blind alleys, and the like, that present unlimitedly entangled relations for him to unravel. He may, perhaps, tell you, he is *looking* how to get in ; but he is almost as likely to say, he is *thinking* how to do so. Or, as another instance, take music. Who would rank as no more than sensory perception the understanding of Bach's master-pieces, where contrapuntal relations have to be cognized as themselves having inter-relations, and these again yet higher ones, in an unending pile upwards ? All such up-building of relational cognition may be symbolized in the following figure, where the solid squares represent the items of the original sensory experience ; the continuous lines, the primary apprehension of their respective characters ; the dotted lines, the awareness of relations of higher and higher order :

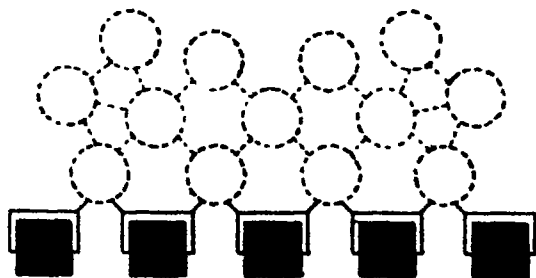


FIG. 3

Another transition towards abstract thinking is by way of what is manifestly thinking of some sort, but yet cannot properly be called abstract. An example is furnished by the test of Interpreting Pictures. The pictorial relations will, in the minds of some testees at any rate, evoke very elaborate stories of adventure, distress, and so forth, all

being still in general of a concrete nature. Indeed, even in ordinary life, concrete thinking plays no uninfluential part.

There remains to add the transition in thought itself from concreteness to abstraction. In what this passage exactly consists will be considered later on (Ch. XVI.). But the fact of its occurring in a smooth rather than abrupt manner may at once be illustrated by the famous ascent of the psyche,

"through transitory objects which are beautiful . . . to that of forms which are beautiful ; and from beautiful forms to beautiful habits and institutions, and from institutions to beautiful doctrines ; until . . . he arrives at that which is nothing else than the doctrine of the supreme beauty itself."¹

Besides the gradualness of all these interposed steps between the perceptual and the abstract cognition, there is the further softening of the distinction between them in that the two operations possess precisely the same general forms, namely, those expressed by our principles. At one extreme, *e.g.*, is the test for colour vision, where persons have to decide which of several threads seen makes the best match with some standard green also actually seen. At the other extreme, they may be tested for moral conception, and have to state which of several abstractions, such as "stealing," "whispering," "charity," or "drunkenness," is most akin to "kindness." In the two matchings, despite all disparity between the matched items, the form of operations remains quite the same, simply a searching for and eventual knowing of the likeness relation. Another striking identity of form can be taken from the test of Analogies. A person may be given, for example, the four abstractions, EXCELLENT, BEST, BETTER, and INFERIOR ; out of these he has to pick the one that stands to GOOD in a relation most like that of WORSE to BAD. Now, just the same form can be employed

¹ *The Banquet of Plato*, trans. by Shelley.

in respect of sensory perception also, as shown in the following figure :

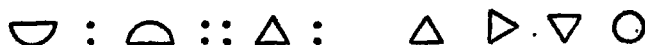


FIG. 4.

Here the testee has to decide which of the four figures on the right best completes the proportional equation on the left.¹

To distinguish trenchantly the abstract from the perceptual cognition of relations becomes still less feasible in view of the fact that very frequently one of the fundamentals is of the one kind, whilst the other is of the other. This commonly occurs, for instance, in recognition, as when the percept of a house or a tree is cognized as resembling the concept which has the same name. Or again, it happens in noticing that any sensory object serves some function, as when the machinery of a motor car is seen to be well adapted for speed.

Multiplicity of Elements. Some further notable varieties in the process of educing relations may arise according to the multiplicity of the elements involved. To begin with, there may be variation in the number of fundamentals that enter into a single process. So far, for convenience of exposition, we have confined ourselves to the simple case where the characters serving as fundamentals are only two in number ; but there may be more. The number increases to three, for instance, in the case of perceiving a triangle as such ; for the awareness of the relation of triangularity must needs have a separate fundamental in each of the three sides. The appreciation of a melody has one in each of the tones, although these may amount to hundreds. When cognizing any continuum as such—for instance, an unbroken line, or an evenly graded band of colour—the number of fundamentals becomes infinite.

Besides such multiplicity of the members functioning within any single eductive process, there has also to be noted

¹ Especially valuable tests of this kind are due to Thorndike, see *Journ. Applied Psychology*, iii 1919, p. 13.

the possible, indeed usual, going on of a great many different processes at the same time. And particularly remarkable is the fact that this simultaneousness appears to happen even in respect of the processes which are built up in successive levels (as described on p. 79). For in such case, the educative growth is unlike the building of a wall, where first one layer is finished, and then another above it, and so on. It is more like the waxing of a tree, which does not first complete its roots, then stem, then branches, then leaves, all in succession, but develops all these overlappingly. So in the cognitive cellulation also, the lower levels are allowed only a limited degree of priority. Whilst they are still extremely obscure, the upper levels already begin growing also, and to the full extent that their as yet very imperfect understructure becomes from moment to moment capable of supporting.

This fact has been strikingly demonstrated in respect of ideation by the following experiment. It has been shown that when a person has read through a short passage in a book, his subsequent reproduction of it usually commences, not with any portion as it was read originally, but instead with a most compendious awareness of the gist of the whole. The explanation given by the investigator himself runs as follows :

" The concentrated essence of the whole is the first thing to come up in our minds, because it is the one thing that was growing while every other thing was being thought." ¹

Evidently, to grasp the " concentrated essence " implies to understand, not only each word as in relation to previous words, but also each clause as in relation to previous clauses, and each sentence to previous sentences.

Such multistratal growth has also been shown to govern sensory perception. For it would appear to furnish the sole possible interpretation of the repeatedly reported fact, that the very first glimpse of a thing or picture, however

¹ Henderson, *Psych. Mono.* xxiii. 1903.

brief, still suffices to generate some awareness of it as a complex whole. We are told that,

"The general plan of the figure was commonly obtained at the first." "The general tendency was to see the picture as a whole at the first glance." "The designs were seen as wholes." "In all cases, the first glance or two was used to gain the general meaning of the picture."¹

Such seeing "as a whole" involves some cognizing of even those relations which bind together the details most comprehensively. And this shows itself to occur whilst such details themselves are still only apprehended in a very meagre degree.

Just the same multistratal simultaneousness has been discovered to pervade even the acquirement of manual dexterities.

"The development of the higher and the perfection of the lower (orders of habit) go hand in hand, throughout the course of learning. Lower-order habits are developed in and through the formation of the higher, as a further development of the higher is dependent upon the careful and final perfection of the lower."²

Instances of such habits of lower and higher orders respectively are the processes of typewriting letter by letter as compared with word by word. That the latter process involves awareness of more comprehensive relations is obvious enough.³

Instead of thus ascending to levels higher and higher above

¹ Bartlett, *Brit. J. Psych.* viii. 1916. See also the paper on "Attention," by Dawes Hicks, *Brit. J. Psych.* vi. 1913.

² Book, *The Psychology of Skill*, 1908.

³ This feasibility of simultaneous advance upon several levels would appear to be of especial importance for education. The decision as to how far there should be a concentration of training on the different levels in succession, or, on the contrary, a distribution over many different but mutually interconnected levels at the same time, is laden with far-reaching consequences.

the original data, the simultaneous multiple eductive processes may tend characteristically to *diffuse* themselves over the interstices *between* these data. The growth is then analogous to what botanists used to call "endogenous." This usually occurs, for instance, in tests of observation. At first, only the more prominent features are noticed; but gradually smaller and smaller details come also to awareness. The transition is of the kind that befalls more slowly—and therefore more noticeably—the appearance of a shore as seen from the deck of an approaching ship. The cognitions of the items in such visual fields stand for the most part on much the same level, in that they simply deal with relations between the directly perceived colours and positions; and yet they can be even more multitudinous than those which, as in the previous example, grow on several levels superposed upon each other.

The importance of this diffuse type of cognitional growth lies in the fact that it is peculiarly liable to escape introspective notice. Although it really is continually extending into very numerous new items of knowledge, it nevertheless is usually not remarked to consist in anything over and above the concomitant mere clarification of the items given originally.

Changeling Basis. There remains one more feature that would appear sufficiently important to characterize a special variety among the cognitions of relation. This is that the fundamentals—always liable to be more or less discrepant from what they seem (see p. 75)—may upon occasion be replaced by some altogether different basis of cognition surreptitiously substituted. To these changelings, if we may so term them, some authors have attached an extraordinary significance, going even so far as to take them to be the sole possible means of relational cognition.

One of the chief of these cases is where the characters constituting the genuine fundamentals are in such an intimate correspondence with certain other characters, that the latter eventually come to function in place of the former, or,

as it were, to *personate* them. In pre-experimental days an almost universal intervention of this kind used to be credited to sensory "images." These, it was supposed, were the substitutive basis at any rate of all those sensory judgments that occur after one or both of the sensations themselves seem to have terminated; an instance would be the discriminating of a colour from one seen previously. And subsequent experimental inquiry, although failing to corroborate any such ubiquitous personation by images, still did produce reports of several other substitutes somewhat analogous. For example, a comparison of the respective extents of two arm-movements has, on investigation, been reported to be based, not genuinely on their extents, but instead only on their durations.¹ Again, the decision as to which of two tones is the higher in pitch has been reported to depend frequently, not upon the heard tones themselves, but upon some difference in the strain-sensations associated with them respectively.²

More recently, however, a greater significance has been usually attached to substitutes of another kind. These no longer even personate the fundamentals proper. They act rather as mere *clues* to the sought relation. In many cases they consist in some modification which the second fundamental undergoes owing to a still lingering influence of the preceding one.

Something of this sort seems to happen, for instance, when estimating the comparative durations of two successive periods. The actual ground for pronouncing the second to be the longer may be only the fact of its finishing at a later moment than that which the estimator, on the basis of the first period, had "set" himself to expect. Similarly, a second weight may be judged heavier than a first one because of the effort to lift the latter being greater than the weight of the former had led to anticipate. Or again, the fact of any

¹ See the investigation of Katz.

² See the classical experiments of Whipple, *Journ. Am. Psychology*.

cognized object resembling one cognized previously has often been reported to become known, not by the first being genuinely remembered, but by the second being distinguishable through a "feeling of familiarity."

Without here stopping to inquire whether the part played by such vicarious bases of cognition may not in general have been gravely exaggerated, we can readily see that even when anything of the sort does occur, the application of our principles is not thereby abolished, but only transferred. Thus, when a relation ceases to be cognized between the genuine fundamentals owing to an intervention of vicarious items, then at any rate a relation has to be genuinely cognized between these latter.

"JUDGMENT"

So far, we have been distinguishing the main varieties of relation-knowing from one another. But there is also need of distinguishing these, one and all, from what bulks so largely, not only in psychological treatises, but also in ordinary life, under the name of "judgment." Indeed, some excuse would appear to be required from us why this familiar and simple word should not have been employed throughout, instead of our complex and rather uncouth expressions.

Comparison. One objection to the word judgment is that it implies some preliminary examination and comparison of the initially apprehended items before proceeding to educe anything further from them. Whereas, in the great majority of cases, relations come to awareness without any such preliminary procedure. Neither time nor mental energy is available for it. The awareness simply sprouts up in consciousness without more ado.

Opinion. Another objection to the word is that it would include, or even be restricted to, belief based upon inadequate grounds. It would thus exceed the sphere of genuine noesis and embrace the immense further cognitive region—still requiring an explanation from us—of mere opinion.

This denotation of the word was already emphasized by Locke :

" The mind has two faculties conversant about truth and falsehood. *First*, Knowledge, whereby it certainly perceives, and is undoubtedly satisfied of, the agreement or disagreement of any ideas. *Secondly*, Judgment, which is the putting ideas together, or separating them from one another, in the mind, when their certain agreement or disagreement is not perceived, but presumed to be so." ¹

Endorsement. Very often a " judgment " is taken to be, not such a combining together of the terms of the proposition, but rather an endorsement of the entire proposition when somehow or other already constructed.

More careful introspection, however, would appear to show that, even when the relation is already quite familiar, still the fundamentals must, so to speak, *re-generate* it. Examine, for instance, the same simple example that we have been considering, namely, the process of knowing that "red and blue are \rightarrow different." The last term, in spite of having been apprehended many thousands of times before, nevertheless now appears to be extracted once more out of the ideas of " red " and " blue," by sheer virtue of insight. A physiological analogy may be found in the restoration of a severed nerve. If its two loose ends be brought together by suture, it will, in favourable circumstances, eventually become whole again. And for a long time physiologists used to believe, naturally enough, that the ends had simply re-joined. But investigation has now shown that really no such re-junction ever occurs. Instead, one of the stumps (that which is connected with the cell-body) generates anew all the rest of the nerve, whilst the other stump simply perishes.

Volition. Of all the objections to the word judgment, however, the most radical has still to come. Originally, this

¹ *Human Understanding*, bk. iv. ch. xiv.

word was a figure of speech derived from the law; *judicare* signified to pronounce a legal decision (*jus dicere*), and is cognate to *jubere*, which means to command. Its introduction into psychology and philosophy seems chiefly attributable to the lawyer, Cicero.¹ But this figure of speech was of the kind that grammarians call metonymy; it was like saying that "Socrates drank death," instead of "poison." In truth, the arrival of the judge at a decision is neither the same operation as his acquiring information from the evidence nor anything like it, but only its result. This result, the legal decision itself, is not of a cognitive but of a volitional nature. Nevertheless, from denoting this final and volitional operation, the word "judgment" was by metonymy transferred to the earlier and cognitive one.

Like the scent lingering about the bowl that had formerly held rose leaves, however, some suggestion of the older meaning clung to the word still. The latter was by preference applied to operations involving at least a volitional supplement. Take, for instance, the test of discriminating brightness. The testee examines two greys, perhaps for a long time, and finally "judges" one of them to be the brighter. Most certainly, he does not obtain all his knowledge by sudden inspiration at the final moment of decision; he has, rather, been obtaining it throughout the examination. At the final moment, he may even possess less insight than at some earlier one. He may have become fatigued, or bored; perhaps he even decides the matter carelessly, in order to be rid of it. What he does do at the final moment of "judging" is to make the best of the knowledge obtained, give his sentence accordingly, and, above all, resolve that he will abide by it for the practical issue. The whole procedure is analogous to that employed for determining the time on board ship. An officer is charged with the duty of observing as exactly as he can the instant when the sun passes its zenith and thereby indicates the hour of noon.

¹ The history of the corresponding Greek word *κρίνειν* appears to have been different and of relatively small importance for our present purposes.

He calls out the issue of his observations to his superior officer, who responds with the order, "Make it so." And in this fashion the time is "judged," and for the next twenty-four hours "made so."

The inevitable result of such history and usage of the word was that the process of acquiring knowledge became more and more liable to be confounded with the final crisis of adopting such knowledge for practical purposes—a weakness this way already shows itself in the Stoic doctrine of "assent." And as always, the confusion had sooner or later to pay penalty. The volitional constituent in the operations called by the name of judgment was eventually noticed. But this, too, was done in an indistinct manner. The volition was not seen to be an additional event tacked on to the cognitive one; it was taken to characterize the cognitive process itself.

Against this peril the acuteness of the Schoolmen, indeed, resisted well enough.¹ Even Duns Scotus, with all his zeal for the primacy of the will over the intellect, avoids stumbling into the trap.² Not so the more romantic and headlong leaders of the Renaissance. To many Cartesians, the distinction between the cognitive and the volitional processes became almost obliterated.³ In some degree, the same may be said also of many Post-Kantians. And at the present day, numerous writers still tend in some way to confound the two. Among them we cannot but count those also who, ensnared in subtler fashion, define the awareness of truth as a "limitation of activity," an "uncontrollableness," or a "coercion," all of which expressions involve primarily, not cognition, but conation.

¹ Aquinas writes on the point: "Intellectus habet duos actus, scilicet percipere et judicare; ad quorum primum ordinatur donum intellectus; ad secundum autem, secundum rationes divinas, donum sapientiae; sed secundum rationes humanas, donum scientiae." *Summ. Theol.* ii. ii. Q. xlv. art. 2.

² See *Oxon.* 2. d. 42, m. 4, 11 and 12.

³ Perhaps even Spinoza can be charged, not indeed with turning judgment into volition, but rather with doing the reverse, see his *Ethics*, bk. ii. prop. xlix.

Conclusion. On the whole, then, "judgment" would appear to be a crude popular concept, which only resembles our educing of relations to the extent that natural ore resembles pure metal. In order to refine it sufficiently, all its extraneous constituents—such as the anterior comparing process, the posterior volitional process, the spurious processes of mere opinion, not to mention various disfigurements of logical or metaphysical origin—all these would have to be purged away.

And indeed, one of the curiosities of psychology is that such a concept thus refined—so indispensable for the very foundations of the science—should not have been evolved and conveniently named a very great time ago. Had this been done, we should not have here been obliged to employ such cumbrous phrases as "the educing of relations" in order to bring this basal process to unmistakable recognition.

Nevertheless, any hope of actually refining the word judgment in this direction would appear to be chimerical. At least one of the further connotations, namely, the posterior volitional process, has both by history and by etymology sunk too deeply into its meaning to be ever eradicable. The sole feasible usage of it, then, is in those cases where the *posterior volition is meant to be included* over and above the relational awareness pure and simple. And even these cases have a scope of great importance. For they comprehend all that knowledge which establishes itself as part of a man's settled attitude towards his environment. Thus, in sensory tests, they comprise all that is going to count for or against him. And just the same may be said of all his other kinds of relation-finding, including those of the highest ethical significance.¹

¹ Later on (ch. xvii.) there will be some further considerations about "judgment," including an analysis of mere "opinion."

CHAPTER VII

THIRD PRINCIPLE, EDUCTION OF CORRELATES

THE PRINCIPLE.

EXAMPLES FROM PERCEPTION.

Musical Pitch. Problem of Hume. Space, Time, and Movement.

EXAMPLES FROM THOUGHT.

"Controlled Association." Completion Test. Questions. Analogies.

COMPARISON WITH SECOND PRINCIPLE.

Parallelism. Distinctiveness. "Rules." From Particulars to Particulars.

TRANSCENDENCE.

THE PRINCIPLE

INADEQUATE as has always been the recognition accorded to the knowing of relations, incomparably less notice still seems to have been taken of what for us must constitute the next great principle, the third and last of the primary or qualitative kind. It may be formulated as follows. *The presenting of any character together with any relation tends to evoke immediately a knowing of the correlative character.*

As before, the characters concerned may either be simple, or have any degree of complexity. And again, like both the preceding principles, the present one has a noetic as well as a generative aspect; the initially given character together with the initially given relation not only supply adequate rational grounds for the correlative character, but also generate it as an item of mental content. Combining these two characteristic aspects, we have here the third and last "noegenetic" principle (p. 61). In company with the second, but not the first, this third one can be characterized as "eductive"; for here again, the item generated is, so

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to speak, "drawn out" from the very nature of the items presented initially.¹

All three principles can be symbolized and compared by means of the following figures:

FIG. 1.
Principle of
Experience.



FIG. 2.
Principle of
Relations.



FIG. 3.
Principle of
Correlates.



FIG. 5.

In Fig. 1, the black square represents the initially lived experience, whilst the outlined rectangle is the (more or less incomplete) apprehension of this experience. In Figs. 2 and 3, the circles represent relations, and the rectangles are their fundamentals, whilst the lines joining the circles and the rectangles together indicate their "coherence" (p. 58). In both Figs. 2 and 3 the lines are continuous for everything that is given initially, but dotted for that which is generated by means of the process.

EXAMPLES FROM PERCEPTION

For our first illustrative example, we may take once more the case of musical harmony. Just as by virtue of the second principle a person hearing two tones may immediately know that the relation between them is a musical fifth, so also by virtue of the third principle when a single tone has been sounded and the relation of a fifth (as an abstract concept) has been mentally presented, the person may immediately have a presentation of the further tone which bears such a relation to the one given. He may furnish a palpable proof of such a presentation by actually singing the correlative tone.

¹ In vain, however, have been all efforts to discover any single words that would passably distinguish the educing of relation and that of correlates. Among the words that have suggested themselves are "inter-relating and ad-relating," "entithizing and prosthizing," "nexeducing and termeducing." Any happier suggestion would be most welcome.

A more striking demonstration of the same power is to be had by supplying the relation not in the form of an abstract concept, but in that of a concrete instance. Thus, any two tones may be played successively on a piano, and then a third tone played also, but with the instruction to imagine a fourth which stands to the third as the second does to the first. Such a feat can be performed with the greatest facility by musical people, but hardly if it all by the unmusical. Here, obviously, there is a preliminary procedure belonging only to the second principle; two tones are given, and between them the relation has to be perceived. But thereupon this relation, thus brought to mind concretely, is applied to a new tone and conjointly with it generates the awareness of the further tone so related.

The following case—this time taken from the domain of vision—is of peculiar historical interest, since it troubled Hume, by compelling him to admit that even his so-called simple ideas are not always mere relicts of sensory impressions. He wrote :

“ Suppose a person to have enjoyed his sight for thirty years, and to have become perfectly well acquainted with colours of all kinds, excepting one particular shade of blue. . . . Let all the different shades of colour, except that single one, be placed before him, descending gradually from the deepest to the lightest. . . . Now I ask, whether it is possible for him, from his own imagination, to supply this deficiency? I believe that there are few but will be of opinion that he can.”¹

Embarrassed by this evidence of the mind's originaive power, Hume can only comfort himself by urging :

“ The instance is so particular and singular, that 'tis scarce worth our observing.”

A few trials of this kind have been made experimentally by the present writer, but with a convenient simplification ;

¹ *Treatise of Human Nature*, 1739, bk. i. pt. i. sect. i.

in place of Hume's complete gradation of depth interrupted only by the absence of a single shade, there were exhibited two shades the one markedly deeper than the other. On looking at these, it was actually found possible to get a notion, or even an image, of the shade intermediate; and this notion did not come into consciousness in a manner at all resembling any reproduction of previous experience; it appeared, rather, to be directly drawn out of, or educed from, the characters of the two shades actually seen.

But although what was with Hume a mere conjecture is thus now actually verified, strange indeed appears his curt disposal of the case as "scarce worth observing" because "so particular and singular." In the light of our present analysis, on the contrary, it shows itself to be a plain instance of the third universal principle. The initially given fundamen-
 ment is jointly constituted by the two shades that are visible; the given relation is that of lying between these; and the correlate to be obtained is the shade that does so lie between.

Space, Time, and Movement. Let us now turn from the quality and intensity of sentience to its other pair of basal characters, those of space and time, together with the combination of these latter into movement.

Suppose a person to be shown any straight line and to be directed to imagine another one prolonging it. He will at once be able to do so. And he will still be able to comply, if the second line is directed to be perpendicular to, intersecting with, or in any other prescribed manner related to the first one.

Here once more, too, the relation need not necessarily be given in the form of an abstract concept, but may instead be furnished in that of a concrete instance. Thus, the person may be shown the lines P , Q , and X , together with the point Y , and told to draw from this point a line bearing

$\overline{\quad P \quad} \qquad \overline{\quad Q \quad} \qquad \overline{\quad X \quad} \quad \dot{Y}$

the same relation to X that Q does to P . For this to be

feasible, there is not even the least necessity that any of the lines should be exact multiples of any others so as to admit the device of successive superpositions ; the operation can be effected in a perfectly direct manner.¹

To render the task more complex, let any curve *A-B* be drawn, and then let some portion of it, *A-P*, be repeated on an arbitrarily larger or smaller scale, as shown by *C-X*. Any person can straightway with more or less accuracy

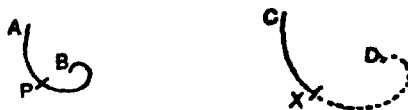


FIG. 6.

complete the curve from *X* to *D*. Here, a set of relations is given by the shape of *A-B*, whilst an initial fundament is supplied by the *C-X*, so that *X-D* constitutes the required correlate. This last example can readily be extended so as to cover the whole basis of pictorial art. Scarcely ever is any object copied, at any rate from nature, without some general change of magnitude. The object itself supplies only a system of relative dimensions ; to this has to be added, as initial fundament, some arbitrarily chosen absolute dimension ; and then there has to be obtained, as correlate, a new system of absolute dimensions complying with the given system of relative ones.

All these illustrations could be paralleled in the case also of time. For instance, just as the shape given in the curve *A-B*, together with the recommencement of it on a different scale in *C-X*, suffices to produce the completing curve *X-D*, so too a musical rhythm that has once been sounded (say on a drum), and then has been recommenced at a different rate, will enable anybody to complete the old rhythm at the new rate.

Passing on to movement, one of the simplest cases is that of perceptual anticipation. For instance, on seeing an object

¹ An especially valuable investigation of such operations has been made by Bühler, *Die Gestaltwahrnehmungen*, 1913.

move in a constant direction with uniform speed, and assuming it to continue to do so, there is at once a possibility of foreseeing more or less accurately where it will arrive at at any later moment. Here, the position already attained by the object constitutes the initially given fundament; the direction, rate, and duration of movement conjointly constitute the given relation; whilst the final and anticipated position is the correlate. Similar feats remain possible even when the relations involved in the direction, speed, or duration become much more complex. Familiar instances are such practically important performances as the anticipation of an escaping prey, or of an approaching blow, or of vagarious street traffic.

An interesting further case is the coordination between visual perception and muscular response. This can be studied effectively by means of the test known as mirror-drawing.¹ The task is to trace with a pencil over a design seen only in a mirror. The latter can with changes of inclination introduce different coordinatory relations between the two senses visual and muscular. Experiment shows that when once any general coordinatory relation has been rendered familiar in certain particular places or directions, it can be utilized for executing the correlative movements in neighbouring places and directions. This power of utilizing coordinatory relations, moreover, differs widely from individual to individual; under pathological influences it is subject to the gravest disturbance.²

EXAMPLES FROM THOUGHT

With all the preceding examples, at least the given fundament, and sometimes also the given relation, were supplied in sensory perception. But the same form of process can also occur when both the initially given members of it are only presented in thought.

¹ This and many analogous spatial performances can be richly illustrated from Whipple's *Manual*, see vol. ii. p. 119.

² Particularly remarkable is the work done on this topic by Head, see *Brain*, xliii. 1920, pp. 143-4.

"Controlled Association." The simplest examples may once more be taken from mental tests and, in particular, from the class entitled Opposites. Usually, indeed, these have been included under the heading of "controlled association." But such an inclusion can only be attributed to a misunderstanding of their basal nature. An instance of the class in question is when a person has to say what is the OPPOSITE to GOOD. He can, in general, respond without difficulty BAD. Sometimes, no doubt, just the same response might warrantably enough be attributed to associative reproduction. And more often than not the two processes, noegenetic and reproductive, do, indeed, act coincidentally and mutually reinforce one another. Nevertheless, in themselves the two would appear to be profoundly different. The reproduction, in so far as it is genuinely such, must stand on a level with any other reproducing by means of two or more ideas that act conjointly. Instances are · LOSS, TERRIBLE, → SHIPWRECK; or again, RUN, FAST, → ATALANTA. In both these cases the response can *not*, but in the case of the OPPOSITE to GOOD it *can*, be educed from the intrinsic nature of the two items given initially.

Reserving our fuller inquiry into this point for a later occasion (Ch. IX.), some light may at once be thrown on it by turning to a couple of responses (by university students), where the educative process manifestly went astray.

The OPPOSITE to CLUMSY is CAREFUL.

" " DESPONDENT " COCKSURE.

Completion Test. Just the same purely educative process sometimes occurs in the completion test of Ebbinghaus (p. 2). The very example we have been quoting can readily be converted into such a test (though naturally of very simple kind). For the sentence to be completed might run: "... is the opposite to good."

Usually, however, this test is notable for the fact that each response must satisfy, not merely a single relation, but a more or less complex relational system. The following may serve as an instance, but for simplicity we will omit only a

single word. The extension of our considerations to the case of several omissions can offer no basal difficulty.

"The radical is not always a man of lofty motives; your mere malcontent, for example, is often rather a selfish being, and every malcontent is, of course, a . . ."¹

The missing word has to be of such a character as to satisfy rationally the numerous relations that extend to diverse items throughout the given passage, including especially the relation implied in the phrase "for example." No word seems possibly to suit save only "radical."

With such instances of the completion test where the response is fully determined in a rational or noetic manner, we may profitably compare others where no such noetic determination occurs, and where, consequently, the response does largely depend on the play of associative reproduction. For example, "The . . . was fighting with the cat."

We may further compare the case where the missing word, although this time indeed fully determined by the context, is still not so determined intrinsically and noetically, but only by way of remembered *information*. Thus, the completion of the sentence, "The . . . is the largest flying animal," by no means admits of being educed solely from the meanings of the given words. This is shown by the fact that the correct answer at the present day would not be the same as during the age of pterodactyls. Whereas the completion of the previous passage about radicals would necessarily remain the same even if all such persons could be swept from off the face of the earth.

Questions. There is another mode of expression by which persons can be instructed to perform cognitive processes of essentially the same form; this is, in fact, the mode of expression specifically constructed for the very purpose, namely, questions. Thus, a person can simply be asked, *What* is the opposite to good? The following is an instance where the question attains to a much greater complexity.

¹ Extracted and adapted from the ingenious *Exercises in Logic* by A. Wolf.

"Jane had the choice of being a factory girl, or a servant. But she remembered that servants only had one night out a week, and she did not mind what work she did, so long as she could go out every night. What did she decide to become?"¹

All this could just as easily have been expressed, instead, in a test of completion once more. Nothing would have been needful but to change the last sentence into "So she decided to become a . . ."

Even such operations with very complex data still admit of being reduced to the same general schema as is given on the first page of this chapter. Take, for example, the following question (again part of a test of university students):

"A is larger than B, and B is smaller than C. What does this tell about the size of C as compared with A?"

Evidently, an initial fundament is given in the two premises conjointly. A relation (evidential) is given in the question itself. And the correlate has to come in the answer. An instance of how it was performed incorrectly is: "A is smaller than C."

Intricate as are all the complications involved in this case, they still admit of being represented on the same diagrammatic scheme.

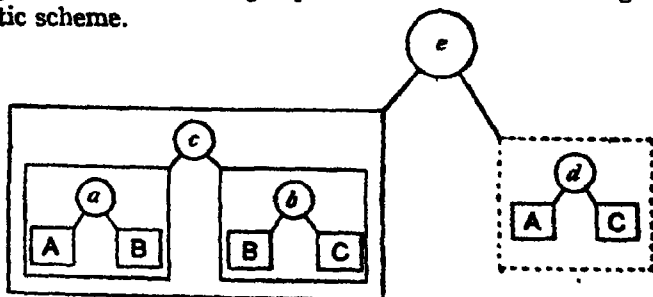


FIG. 7.

Here, *a* represents the relation of "larger,"
b " " " " "smaller,"
c " " " " conjunction,
d " " " " comparative size,
e " " " " higher order relation of no-evidence.

¹ Taken, with adaptation to present purposes, from the clever logical tests of Burt.

and/or

Analogies. In this section, where the data considered are thoughts, just as in the previous one where they were percepts, the relation has no need of being given in the abstract manner, but instead may be supplied by means of a concrete instance. Exemplification is once more richly furnished from the inexhaustible treasury of mental tests, and here particularly from those called Analogies. In these, three terms are given initially, and then the testee has to discover what fourth term will complete a perfect proportion. The same example as before can again be made to serve us. Thus, instead of being asked to say the opposite to good, a person can be required to complete the line given below.

"WHITE is to BLACK as GOOD is to . . ."

An example of such an operation being done incorrectly (by a university student) is the following :

"BEFORE is to BEHIND as FUTURE is to *PRESENT*."

COMPARISON WITH SECOND PRINCIPLE

All these examples of the third principle may now enable us to draw a general comparison between it and the second. As shown to some extent already (p. 91), the two run on closely parallel lines. Both alike, as indicated by the figures (p. 92), are manifested in concrete unit-processes. In both, these processes possess the same characteristic constitution, inasmuch as the members consist of two or more fundamentals together with a relation (p. 74). Between these, again, there is in both cases "coherence" (p. 58). And in the case of the third principle, as in that of the second, the entire process may be crowned with not only belief but also insight (p. 55).¹

The parallelism extends, further, to all the previously mentioned variations of type. In both cases alike, either of the given members may or may not be directly known in

¹ The question as to whether such insight *must* ensue at all is deferred for ch. vii.

experience (p. 64). The fundamentals may vary in number from two upwards (p. 81). The growth may take place on several levels simultaneously (p. 82). And on the same level, it may be more or less diffused (p. 84).

Yet another resemblance holds on a point which we have hitherto left untouched. This is that out of the three members entering into the process, not only two, but even a portion of the third, may be given initially. In such cases the task is not to discover the entire character of the third member, but only to complete a partial specification of it into a fuller one. For example, on a person being shown two points he could be asked, not simply to perceive the relation between them, but to perceive in particular the relation in respect of space. So, too, instead of his being asked simply what is the opposite to "good," he could be required to say what *quality* is the opposite. The two cases can be represented diagrammatically as follows, where the continuous lines symbolize what is given initially, whilst the dotted ones stand for what has to be educed.

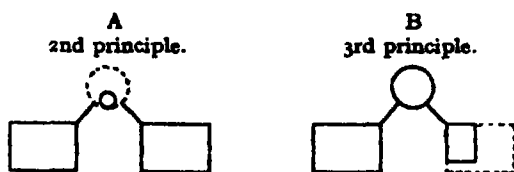


FIG. 8.

In short, the final stage reached by the process is in all respects whatever just the same in both cases, the sole difference being as to which two out of the three members are given initially. Above all, *whenever the one process is possible, so too is the other.*

Distinctiveness. Notwithstanding all this resemblance between the two processes, these nevertheless are absolutely distinct, even in such instances as at first sight are liable to be confounded with each other. Thus, it might easily be thought that the operation of bisecting a line is effected primarily (not merely checked afterwards) by means of perceiving relations, those, namely, of equality or inequality

between the halves. But such an opinion is contradicted by experimental trial.

Let any one actually attempt to discover the centre of the line given below by means of perceiving relations; of course in so doing he must not behave in any manner that presupposes knowing the centre already. Let him, say, commence at the left extremity and move continuously towards the right, satisfying himself as he goes that he passes over no point at which the two segments exhibit the relation of equality. He will—according to our experimental results—probably have to make an appreciable pause in order to perceive genuinely that even any place quite close to the extremity is thus non-central. Thence, perhaps, he will make a sweeping movement to the right for half an inch or so, in order once more to perceive genuinely that no point along this extent is central. A likely procedure next, if he is careful, is for him to realize that the intervening half-inch was skipped rather than genuinely examined. In this way, with repeated stoppings, and almost as many conscientious harkings back, he will probably arrive at the conviction that the task is quite a formidable one.



FIG. 9.

Let our inquirer now change his procedure from the eduction of relations to that of a correlate. Let him mark well the position of the left extremity, and then that of the right one (passing across by any circuitous path so as to see as little as possible of the rest of the line). Thereupon, without the slightest further preparation, let him try to put his finger straightway on or near the centre. This he will find himself able to achieve with the greatest ease. Moreover, he will deal in this way with a long line quite as quickly as with a short one. Above all, he will notice that the whole process is radically unlike the previous exploring in search of the relations of equality and inequality.

• "Rules." Our comparison between the two principles

may be pursued further ; besides their intrinsic close resemblance and yet trenchant difference, there has also to be considered their functional cooperation. The latter is of especial importance in the vast field afforded by the application of rules, taking this word in the broad Kantian sense of embracing all uniformity of procedure under diversity of circumstances.

A leading case is that of scientific *laws*. Every such general law asserts a relation between two very abstract fundamentals. Each particular instance of the law contains these same two fundamentals, but in less abstract and more specific version. When applying the general law to the particular instance, the former supplies the relation and the latter a specific initial fundament ; from these two data there is then educed the correspondingly specific correlative fundament. Take as example the law of equivalence of energy between work and heat. The ability to apply this law means that, given initially a knowledge of the law (relation of equivalence between the two abstract fundamentals, work and heat), and given also a particular expenditure of heat (the initial fundament), then at once there arises the possibility of cognizing the particular amount of work done (the specific correlative fundament).

The whole operation may be represented in the following diagram, where the thick continuous lines depict the given law,

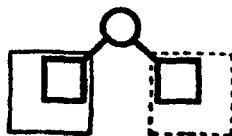


FIG 10

the thin continuous lines mark out the specific fundamentals also given, whilst the thin dotted lines stand for the specific correlate educed. With this may be compared A and B on p. 101.

From scientific laws, there is an obvious extension of the principle to the vast field of practical *methods*. For a relation (or system of such) supplies the basis of each of these,

so that the applying of such a method involves once more the eduction of a correlate. This can be seen by analyzing any ordinary instances, such as a teacher guiding himself by some precept of pedagogy, a chemist compounding his drugs according to formula, or even a savage performing his arithmetic by the aid of his fingers. Here belong, also, all those mental tests where certain items are given together with a prescribed manner of rearranging them ; such are, the solving of jigsaw puzzles, the repeating of the alphabet backwards, and, to some extent, paraphrasing.

Closely akin to the application of methods is that of *maxims*, as, for example, "Look before you leap." Each such maxim gives only a relation together with two very abstract fundaments (explicit or implicit). To apply the maxim involves some particular situation being given as the specific initial fundament, and then some particular response being educed as the correspondingly specific correlate.

Now, all the preceding applications of rules—whether laws, methods, or maxims—have one great biological feature in common. Whilst themselves consisting in the eduction of correlates, they necessarily imply antecedent eduction of relations. For whereas the former process brings the rules into usage, the latter originally discovers them. And so in life, the two principles come into action alternatively, each being wholly dependent upon the other. The cognition of relations without that of correlates would be useless ; but the converse would be impossible. The cooperation is like the successive expansion and contraction of the heart. The latter would in vain fill itself with blood, if it did not then proceed to discharge this ; but it would have nothing to discharge, if it had not previously filled itself.

From Particulars to Particulars. Cooperation between the preparatory phase of obtaining relations and the applicative phase of educing correlates becomes especially intimate and obvious when the transition from the one phase to the other occurs in a direct manner. This happens whenever the relation—although still, as ever, the vital factor in the whole

process—nevertheless does not happen to arrive at the stage of being abstracted from its fundaments (or even perhaps from individual occurrence at all). Despite thus remaining still embodied in certain concrete and particular cases, it nevertheless can already be applied to further cases no less concrete and particular.

The possibility of such direct transference has been already noticeable in all our classes of experimental examples. Most prominent of all in this respect was the test of Analogies. In ordinary life, also, the most conspicuous instances are those designated as "inference by analogy." To this class must be ascribed almost all pre-scientific deduction and even conduct. By its means men must have learnt to seek shelter on seeing the sky grow black, countless ages before they could formulate any abstract relations of meteorology. And by the same means, probably, their tendency to behave upon lines that had gained their approval long preceded their drawing up abstract codes of ethical relations. Further examples could be multiplied without end, from the loftiest flights of art down to the simplest sensory perceptions.

Potentially, the sphere of this more concrete form of correlate-education is exactly the same as that of the more abstract form. Wheresoever the relation can possibly be applied in the one form, there it is possible in the other also. But still the very fact of the concrete embodiment of the relation being thus everywhere dispensable proves such embodiment to be a mere superfluity. The essence of the process as required to be known for scientific psychology, therefore, is not attained until analysis has sublimated out the pure essential factor, the relation itself.¹

¹ Much the most valuable work done hitherto on this case is, in the opinion of the present writer, that of Stout (*Analytic Psychology*, 1896, ii. pp. 52 ff.). Read (*Brit. J. Psych.* iv 1911) and Bühler (*Die Gestaltwahrnehmungen*, 1913). Unfortunately, Stout appears not to have carried the analysis of the process to the point of discovering the dominant part played by the relation involved; the very word relation is hardly mentioned by him at all. Hence it is, perhaps, that in his subsequent and much more comprehensive *Manual of Psychology* the whole matter has been altogether dropped again.

TRANSCENDENCE

This chapter may be brought to its close by briefly suggesting that the process with which it has dealt, the educing of correlates, may perhaps be destined to furnish the master key to a group of the hardest problems in ontology and epistemology ; namely, those which concern the power of the psyche to transcend itself.

The most general form of all these problems is to be encountered in the vain attempts that have hitherto been made to explain away the really incontrovertible fact of a person being able to have a presentation of things outside of his own momentary experience (Ch. XII.).

Now, no such feat could possibly be effected on the basis of our first principle, since this excludes it by express definition. And even the aid of the second principle, that of educing relations, offers no means of escape. The general scope of cognitive content attainable by these two together may be symbolized as follows :

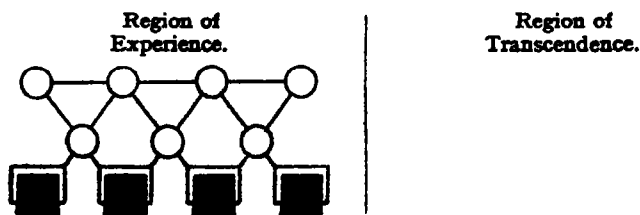


FIG. 11.

The blackened squares, as before, represent lived experiences ; the outlined rectangles, cognitions of them ; and the circles, relations cognized between the latter cognitions. In this fashion, the second principle can, indeed, pile the superstructure of cognition to any extent upwards. But it can never by a hair's breadth exceed the original foundation laterally ; it must for ever remain wholly confined within the psyche's own experience at the very moment.

But now let us bring in as supplement the principle of correlates. This can, to begin with, only have for initial data any fundamentals or relations that are apprehensible

within experience. But pre-eminent among such originally available fundamentals is the "self" (however interpreted, see p. 53). Equally pre-eminent among the available relations is that of "otherness," seeing that this arises with the first glimmerings of any sort of discrimination. With these initial data to hand, there must necessarily—by virtue of our principle—ensue a possibility of generating as mental object an entity other than self, a non-self. Symbolically, we now get the following schema. The two thick lines indicate the connections involved in the transcending process itself.

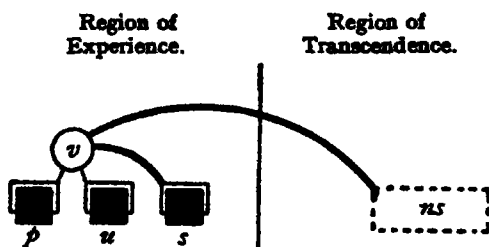


FIG. 12.

$p\}$ = any two discriminated items
 $u\}$ of experience,
 s = self,
 v = relation of otherness, and
 ns = non-self.

The same procedure that is thus capable of transcending the boundaries which originally enclose the Self has in similar fashion the power of overleaping all the other original limitations. By its means—and in no other possible way—presentation can pass from the Space that is internal to that which is external (p. 40) ; and so, too, from the Time that is present to that which is past or future (Ch. XIX.).

At this point we come to the end of our tether. There are, indeed, two questions that irresistibly suggest themselves. In what way does the transcending presentation come to be invested with belief ? And to what extent is it ever crowned with genuine insight ? But the former of these two great questions is chiefly, and the latter wholly, beyond our present purview, this being solely psychological.

CHAPTER VIII

SOME SPECIAL CASES OF EDUCION

NOETIC EDUCION AND REAL EXISTENCE.

Relations of Cause. Relations of Objectivity. Relations of Attribution.

THE CONSTITUTIVE RELATION.

Varieties. Common-sense Appreciation. Educutive Function.

LANGUAGE.

Constituted Purport. Supplemented Purport. Indicated Purport. Further operations in Understanding. Failure in Execution. Analysis of Expression.

INTERPRETATION OF PICTURES.

Pictorial Tests. Constitutive Processes. Indicative Processes. Exceptional Operations.

NOETIC EDUCION AND REAL EXISTENCE

THE three preceding chapters have had under consideration the processes of "drawing out" or "educing" certain characters from others presented initially. We saw that the most vital factor in such processes always consists in relations, and that these can be divided into ten different classes. As may have been noticed, however, our examples were not taken impartially from all ten, but almost always from those of space, time, likeness, or evidence.

Our reasons for making so little mention of the remaining classes were diverse. As regards the relation of identity, this was neglected simply because its chief interest is not for psychology, but rather for ontology and epistemology. And as regards the relation of conjunction, this was deemed to have been disposed of sufficiently by the summary reference made to its great field of application in arithmetic (p. 72).

But as for the four classes, attributive, causal, objective, and constitutive respectively, these have been reserved for special consideration here because they present a common difficulty. It is one where, as so often, the psychological peace has suffered from quarrels that properly belong to philosophy.

Relations of Cause. Commencing with causation, and in particular with that of the physical sort, many philosophers have held this to be altogether destitute of intuitive evidence. Such a view carries us back to the teaching of the Cartesians, that physical matter, since its essence consists solely in extension, is really inadequate to act causally at all. We are reminded of Hume, who so strongly insisted that no known qualities whatever of physical things involve essentially any causal influence. And from these gnosiological doctrines, there is an easy drift into the psychological assertion—startling enough, but supported both authoritatively and persuasively—that the relation of cause is devoid of fundamentals!¹

Now, the problem as to whether causes truly exist or not must here be waived. As psychologists, we are unconcerned with the question whether any parts of the cosmos can really and truly modify any other parts. But there is another question, which, although often confounded with the previous one, does possess the deepest interest for psychology; this asks whether physical matter *as ordinarily conceived* is of such a nature as to exert or suffer causation. And to this second question, at any rate, our answer must be affirmative. Let a billiard ball be conceived, not in the Cartesian manner as a purely spatial system, nor in the Humian fashion as a bundle of sensory impressions, but in the way of both physical science and common sense as a solid momentum-carrying body. Two colliding bodies such as these, it must here be urged, would by rational necessity affect each other causally. In consequence, the noetic

¹ This view, which must here be altogether rejected, has in fact found the acceptance even of Meinong, see his *Hume-Studien*, p. 110.

eduction of either relations or correlates becomes in such case perfectly feasible.

Indeed, it seems reasonable to assume that along this *a priori* eductive road must have come the inspiration even for Newton's three laws of motion, with their vast superstructure, the science of dynamics. Consider the essential meaning of the proposition, that "every body continues in its state of rest, or of uniform motion in a straight line, except in so far as it is compelled by force to change that state." This proposition is clearly not devoid of self-evidence. And in so far as it is self-evident, it affords scope for eduction. The antecedent state of the body can serve as an initial fundament; the assumed transition to the subsequent state involves a causal relation; and from these two data, the mind is able forthwith to educe this state itself, the further uniform motion. Indeed, these laws of motion are after all only special cases of the ancient and purely rational laws enounced already by Diogenes (of Apollonia) and Democritus, that nothing can be produced out of nothing, and nothing can be destroyed so as to become nothing. These last and wider rational laws have, even in our own times, played the leading part towards making the greatest of scientific discoveries, that of the conservation of energy.¹ As for the experimental evidence in favour of the conservation, its influence here, as elsewhere, has not been nearly so all-powerful as is commonly supposed; it has served, not so much to supersede self-evidence, as to turn the scale between theories otherwise in respect of self-evidence evenly balanced; and even this it only achieves by being self-evident itself.

Parallel, though more complex, facts disclose themselves when we turn from physical to volitional causation. A man, as ordinarily conceived, is a being able to direct both the movements of his body and the activities of his mind. And

¹ What continual and potent inspiration towards this achievement came from such self-evidence can best be seen in the accounts of the life of its author, Julius Meyer.

in the case of a being as thus conceived, the volitional act does rationally suffice to determine the said effects. Possibly man is in truth no such being. Analogous doubts may be raised about every entity in the cosmos as ordinarily conceived. But in all cases alike, the untruth, or even deliberate fictitiousness, in respect of real existence does not interfere with the rational validity of the relation ; nor, consequently, does it preclude the relation from coming eductively to awareness.¹

When once the feasibility of genuine noetic education has been admitted in the two preceding capital cases of causality, viz., momentum and volition, then all others fall so readily into line that they may here be dismissed with the briefest mention. Instances in point are physical things as they are conceived by young children or by primitive races. The real existence of any such things would appear to be even more improbable than that of things as conceived by persons who possess what usually passes for culture. But still, the concepts of such things may give rise to perfectly legitimate awareness of relations or of correlates. Another notable instance is that of causation conceived, not as actually occurring, but as merely potential ; of such sort are the concepts of " power," " property," " faculty " and " potential energy." These, even though perhaps quite false as regards real existence, nevertheless possess intrinsic natures the presentation of which is fully adequate to generate the knowing of either relations or correlates. So, too, such concepts as " necessary conditions," " part-effects," " resistances," and a great many more.

In order to illustrate the foregoing considerations, and at the same time to notice something of their practical bearings, we may once more betake ourselves to mental tests. We will, as before, restrict ourselves to those which have been given to normal adults of good social status and education ;

¹ Among the most interesting recent expositions of the awareness of exercising power is that which we owe to Boyce Gibson, *Proc. Arist. Soc.* 1911-1912, p. 65.

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the great bulk of these have been university students, military and naval officers, and members of the Civil Service. The following are a couple of instances taken from Analogies of the selective kind, namely, where the fourth term has not to be evoked into consciousness, but only to be selected out of several alternatives already given.

A. "PRISONER is to JAIL

as WATER is to : PRISON, DRINK, TAP, BUCKET."

B. "ARTIST is to BEAUTY

as FARMER is to : PICTURE, PLOUGH, USEFULNESS,
MUSICIAN."

The correct completion of *A* depends upon perceiving that the characteristic relation of a bucket to water is that of preventing its escape. This causal relation issues rationally from the essential natures of the related fundamentals as ordinarily conceived. Accordingly, the answer BUCKET was given by almost all those testees who on independent grounds (confidential reports) had previously been rated as highly "intelligent"; whereas the great majority of those who had been rated as "unintelligent" gave the answer DRINK. Similarly, the completion of *B* in the correct manner depends on perceiving the relation between FARMER and USEFULNESS, namely, that which a producer bears to an abstract quality of what he produces. This, too, was answered correctly by nearly all the "intelligent" persons; whereas the "unintelligent" almost unanimously answered "plough."

Relations of Objectivity. After this scrutiny of the causal relations, a very brief treatment can be accorded to those which consist in, or are based upon, mental objectivity (p. 70). For the two kinds run on closely similar lines. As example we may take the following selective Analogy :

"OBTAIN is to SEARCH

as VICTORY is to : MANOEUVRE, TRIUMPH, SEIZE, DISCOVER."

The relation of OBTAIN to SEARCH is that of satisfaction to purpose. Now, the question as to the *real* nature of satisfaction involves an acute controversy. But as a concept in

ordinary usage, it is fairly unequivocal. Accordingly, almost all the testees who have been estimated as "Intelligent" in ordinary life gave now the response MANŒUVRE; but the majority of the "unintelligent" gave instead TRIUMPH.

Relations of Attribution. In the same summary fashion, we may here deal also with the relations of the class called attributive, p. 68). Take the following selective Analogy as an example:

"PRECIPICE is to STEEP
as PLAIN is to: RUGGED, MOUNTAIN, EVEN, LEVEL."

The relation of PRECIPICE to STEEP is the attributive one of fundament to character.¹ This again, whatever metaphysical difficulties it may introduce, is nevertheless plain enough as conceived currently. Hence, when several tested persons—always among the "unintelligent"—proceeded to complete the analogy with the word MOUNTAIN, or RUGGED, instead of LEVEL, the attributive relation must have been realized by them inadequately.

Another instance is the following Analogy, not of the selective, but of the inventive, sort:

"CLOTH is to COAT as LEATHER is to . . ."

Clearly, CLOTH is a fundament to the vestural character involved in COAT. The correct solution is, accordingly, BOOTS, or SHOES, or FOOTWEAR. It is not RIDE or BAG, as given by some of the less "intelligent."

Throughout, then, the concepts in ordinary usage form a system which, even if perhaps altogether illusory, is none the less rationally interconnected. They furnish perfectly adequate material for the processes which arise by virtue of our second and third principles. Relations and correlates can just as well be educed from concepts of the sun revolving round the earth as from those of the earth revolving round the sun.

¹ It will be remembered that "fundaments" are possessed not only by relations, but also by characters (p. 64).

THE CONSTITUTIVE RELATION

There remains still the class of relations which we have called "constitutive." The reason that these have so far not been specially considered by us is that they have been reserved for separate consideration with exceptional fullness. They suffer more than all others from being so extremely familiar that theories everywhere take them for granted—and therefore overlook them.

Varieties. These constitutive relations are essentially of a secondary nature, in that (as we have seen, p. 71) they always spring from one of the other nine classes of relation. And they present important variations according to the class from which they happen to issue. Consider the simplest, those which come from the *conjunctive* class. Let the two fundamentals be represented by X and Y , whilst the conjunctive relation is symbolized by the plus sign. Then the X , the Y , and the $+$ stand in the relation of constituents to the entire ($X + Y$). Moreover, the X and the Y have a different kind of constitutive relation from that of the plus sign; the former is the very familiar one of "parts" to "whole," or, more precisely, to "sum."

But turn, now, to the class of relations which we have called objective, and, in particular, to the basal relation of this class, namely, that which the cognized object as such bears to the process of cognizing it. This constitutive-objective relation would appear to have been over hastily accepted by most writers as merely the above conjunctive one again, that of a part to the whole. And herein lies the main source of all the prevalent confusion about mental "contents" and "acts." In truth, the constitutive-objective relation differs from the simply conjunctive one of parts to whole profoundly. Above all, the former relation is *not* limited, and the latter is, by the law that every constituent must be actually present whenever that which they jointly constitute is so. For example, the object of a thought taking place to-day can quite well be "yesterday."

In other classes, the distinctive nature of the constitutive relation becomes again different. Take the class that we have called attributive, as exemplified in the black triangle below.



FIG. 19.

The triangularity and the blackness together with their inter-relation jointly constitute it. But this inter-relation is far other than that of bare conjunction. It is a peculiar sort of what perhaps may be termed inter-permeation. Even here, then, to talk of "parts" is at least a different usage of the word from the stricter one appertaining to pure conjunction.

Common-sense Appreciation. Very remarkable is the fact that this constitutive relation, so often overlooked theoretically, is by no means ignored practically, even by persons of comparatively inferior education. Indeed, it has left a profound mark upon quite ordinary modes of speech. Every one can distinguish between perceiving "*that* two lines are parallel" and perceiving them "*as* parallel." Introspectively, the two cases are conspicuously different. The "*that*" signifies the simple process of knowing the lines to possess the relation of parallelism. The "*as*," on the other hand, shows that these lines together with their relation of parallelism are further cognized as "*constituting*" their collective resultant.

Eductive Function. Finally, let us consider when and how the constitutive relation comes to operate in our eductive processes. For it to do so, it must mediate between the two following things; *a*, multiple items as they are before undergoing constitution; and *b*, these same items after undergoing it.

A notable instance of relation-educing in this manner is afforded by the self-evident awareness that certain phenomena of space and of time collectively "*constitute*" the phenomena of movement. Here, the notions of space and

of time (including their inter-relation) serve together as the one fundament; the notion of movement, as the other; and between these two is then cognized the constitutive relation. As an instance, next, of educing correlates, take the simple awareness that two and two make four. Here, an initial fundament is given in "two and two"; a constitutive relation is involved in "make"; and the correlate is educed as "four."

As a further illustration of this constitutive process, consider the "creative resultants" which terminate and crown the great work of Wundt.¹

"Wherever we may look round in the region of those processes which we in the widest sense call 'psychic connections' (Verbindungen), or—since all actual mental processes are composite, and therefore connections—wherever we may look around in the wide realm of psychic phenomena at all; always and everywhere the conspicuous characteristic meets us, that the product derived from any number of elements is more than the mere sum of the elements, that it is more than a structure of the same kind as the elements, deviating from them only in respect of quality or quantity; but that, instead it is a *new* event which in its essential characters is absolutely incomparable with the factors cooperative in producing it. This fundamental property of psychic occurrence we will call the principle of *creative resultants* (schöpferische Resultanten)."

Obviously, this "resultant" is really nothing else than what the elements collectively "constitute."²

¹ *Physiol. Psychologie*, 1911, iii. p. 555.

² Another great problem at once elucidated by the process of constitution is that which, started by Mach, now splits the eminent Austrian school into opposing parties. Is such a thing as melody or a shape (taken apart from its fundaments) merely the sum of the multiple relations involved? Or is it something automatically superposed on these, although intrinsically different from relations of any kind? Or does it need for its generation, some separate and peculiar cognitive activity of "production"? Among the advocates of the second of these views are Ehrenfels and Cornelius, by

LANGUAGE

So far, we have only taken into account the constitution effected by the full set of members in a noegenetic process, namely, a relation and two fundamentals. But instead, and in a similar manner, a relation can unite constitutively with a *single* fundamental. This occurs, for example, in becoming aware that the meanings of "happening" and "before" jointly constitute that of "previous"; or that those of "make" and "known" do that of "publish." As regards the nature of this process which connects a fundamental to a relation, introspection would appear to show that it for the most part consists in perceiving these two as being themselves linked by a further relation, one of higher order.¹

In this way, we are prepared for and conducted to an examination—however summary—of nothing less than the very foundations of *language*. With the functioning of the words individually, indeed, we have not for the present to concern ourselves. There are, no doubt, very numerous operations involved even here; the building up of the auditory, visual, and kinaesthetic complexes; the interlacing of these with one another on rising levels, sensation with sensation, letter with letter, syllable with syllable; and finally, the attaching of such linguistic conglomerates to items of cognition in such a way that the former shall "mean"

whom such things as melodies and shapes are all called "shape-qualities." On this side is also Stumpf, by whom they are named "forms." And here stands Krueger also, whose work on this topic is continually rising in importance, and who prefers to call them "complexive qualities." See his *Beitrag zur Festschrift, Joh. Volkelt überreicht*, München, 1918. Also, "Die Vorstellungen der Tiere," by his disciple, Hans Volkelt, in the *Arbeiten zur Entwicklungspsychologie*, ii. 1914. The chief upholders of the opposite side, that which asserts the existence of a special power of "production," would appear to be Meinong, Höfler, Benussi, and Witasek.

¹ The objection might perhaps be raised that this additional relation must, then, itself unite constitutively with the terms which it cements, and for this purpose there must be postulated additional relations of order higher still; and so on in infinite regression. All this must be admitted; but it does not—as sometimes overhastily assumed—involve any absurdity. An example of such an infinite regression is afforded by the perception of any ordinary curve. The curvital relations (mathematically, "differentials") can be picked out one by one, each being of higher order than its predecessor, in a series which has no numerical limit whatever.

the latter. But still most of these are comparatively straightforward processes of sentience, relation-educing, and associative reproduction. The one thorny problem raised, namely, the nature of "meaning" as a phenomenon, will be reserved for consideration later (Chs. XII. and XIII.).

At present, then, we have only to examine the functioning of words when aggregated in series, such as phrases, sentences, passages, and so forth. The collective meaning, or the "purport," as it may be called, of any such a series of words is no more identical with the sum of the individual meanings than a finished house is the same thing as a pile of mere bricks and scaffolding poles. In order that the collective meaning should be constructed out of all the individual ones, there is need of manifold cognitive operations; and these often involve our second and third principles in the most subtle manner. To carry through the analysis will require no little exercise of patience.

Constituted Purport. The collective meaning or the purport will be found to be fed from three chief streams. The first of these has its source in the fact that the leading characteristic of the initially given individual meanings of the words is their state of extreme disintegration. Each of them has, in general, been abstracted from many things without which it could not exist really. This is particularly important to the extent that it occurs with relations. In language, any of these can be presented quite apart from one, or even both, of its fundamentals; for example, such words as "likeness" can be given and understood by themselves. Whereas in reality, no likeness can possibly exist save as relating together two or more like items.

Evidently, then, the understanding of the purport of language must include the putting of such fragmentary meanings together again. And this re-integrative operation in its simplest form is just the process which we were discussing in the previous section; the individual meanings are connected together in such a way as to "constitute" a collective meaning or a purport.

The constitutive relation thus involved has a special, but by no means exclusive, tendency to be of the attributive class. It is of this class in the case of coupling nouns with attributive epithets, as "long-time," "violent-blow," "learned-men." Here belong, too, all attributive complements, as contained in "the-time-is-long," "the-blow-is-violent," etc. To these must be added all attributive adverbs, such as enter into "before-now," "extremely-good," or "to-run-quickly." And similar are the cases where an epithet or complement, adjective or adverb, has itself a complex structure. Turning, next, to the classes other than attributive, examples are, "dropping-wears-away-a-stone," or "know-thyself." The first of these belongs to the causal class, the second to that which we have called objective.

Such constitutive process of understanding, it should be noticed, is often only executed to a very incomplete degree. Thus, the purport of "round square" can be understood up to the point of presenting the first individual meaning as an attribute of the second; but it cannot possibly be understood up to the further point of presenting any resultant geometrical figure.

Supplemented Purport. The second tributary to the purport is of what may be called a *supplementary* nature. It makes its appearance when some of the words—perhaps even the larger portion—have been tacitly assumed by the speaker, and therefore must be added on by the hearer. Examples are, "Tom plays well, but Dick badly" (omitting "plays" after Dick); "The man has gone away" (omitting "who was here" after man); "Fire!" (omitting "There is yonder a" before "fire"). Obviously, the operation of adding such supplements has the same form as that of filling the gaps in the passages of the completion test. And this, as we have seen (p. 97) may upon occasion be simply the eduction of a correlate. Usually, however, the operation is more complex; its analysis must be deferred until later (Ch. XI.).

Indicated Purport. Finally, in addition to the conjoining of the individual meanings of the words and the supplementing of them by other words, there is yet a third kind of contribution to the general purport of the passage. In this kind, the individual meanings are made to serve, not on their own account at all, but only by way of *indicating* further cognitive items. For an example, we may take the historically interesting case of "the-root-of-two." Here, the purport itself, as was rightly noticed by Bolzano,¹ is far from being exhaustively constituted by the meanings of the four given words. Indeed, these may not enter into the purport at all. To arrive at this latter is an achievement that requires our third principle. "Two" supplies the initial fundament; "the-root-of" evidently includes a relation of the "two"; and to obtain the character of this root is nothing else than to educe the correlative fundament. "Indication," then, has its basis in correlative eduction.²

It may, perhaps, seem somewhat strange that the very same eductive process which before was employed to evoke a missing word—as in the Analogies, in the Completions, and in answering ordinary questions—should here be needed even to understand the words actually given. But a proof of the identity of the process is easily supplied by applying these diverse forms of test to one and the same actual instance; and this may be our old familiar one. Thus, the process which achieved the Analogy "WHITE BLACK :: GOOD : . . .," or which completed the sentence, ". . . is the opposite to good," or which answered the direct question, "What is the opposite to good?"—this same process is quite evidently required also for the bare understanding, if *complete*, of "It is the opposite to good."

When and why such indicated purport enters into the employment of language may now be seen readily enough. It is introduced in precisely the case mentioned at the

¹ *Wissenschaftslehre*, 1837, § 64.

² The action of "indicating," it may be here observed, appertains to communication, and therefore to the class of relations that we have called "objective."

beginning of this section, that is, when the constituted collective meaning links a relation to only a single fundamēt. For these two individual meanings together give birth to their correlate ; and in the very act of so doing, they renounce being any portion of the purport themselves.

Further Operations. Although the operations just described, constitutive, supplemental, and indicative respectively, supply the main current in the understanding of language, there usually occurs much additionally.

Thus, the relations as originally furnished in the individual meanings of the words may not be specific enough for the aim in view ; and any such initial deficiencies have to be made good by assistance from education. Even in our previous example of a " black triangle," the relation between the shape and the blackness is by no means given fully in the individual meanings of the two words ; for the adjectival form of the word " black " supplies only the general attributive relation, not the needed more specific one of inter-permeating (p. 115). A very large number of further educations usually enter into the understanding of the language by way of embroidering the main body of the discourse with all sorts of incidental references, commentaries, and criticisms. For example, one clause may be noticed to corroborate or to contradict another.

It thus appears that the understanding of even comparatively brief linguistic structures must involve the noetic unit-processes in very great number. Whether by the educating of correlates or by that of relations, and whether by constitution or by supplementation or by indication, every single word has to make its influence felt in manifold directions. It has to do so, firstly, upon the phrase in which it stands immediately inserted ; secondly, and through the mediation of this phrase, upon the sentence to which the phrase primarily belongs ; thirdly, through the further mediation of the said sentence, upon more complex sentences in which the latter is compounded ; thence again, upon paragraphs, chapters, and other aggregates of still greater

magnitude. In this manner, the final meaning of an entire volume may be the resultant of unit-processes as numerous as the cellulations which make up the growth of a highly evolved plant or animal.

Failure in Execution. From the practical standpoint, the main interest in all this linguistic proliferation derives from the cases where it fails of accomplishment. This failure is occasionally due to one or more of the multitudinous unit-processes being especially difficult. More often, the formidableness of the operation arises, rather, like that of a Lilliputian army, from the overwhelming multitudinousness itself. If any sentence whatever be made sufficiently complex, the human mind can no longer grasp the entire collective meaning correctly. Sometimes portions of this meaning will drop out of consciousness, not so much through fading by lapse of time, as through yielding to the intrusion of further portions. At other times definite errors will creep in; these may even be surprisingly gross.

Examples may, as usual, be furnished by mental tests and especially illuminated by the errors made in executing them. In one of these tests the instruction was given:

"Place the first nine digits in three rows, so that the first row contains only odd numbers, the second only even numbers, and so that the first digit in each row is not greater than three."

Several of the testees lost sight of the rows having to be three in number, and consequently made only two. The following is another instance of error: here, the misunderstood meaning has not to be "constituted," but "indicated" by the individual ones:

"In this sentence, erase the last letter but two in the last word but one."

Several of the testees erased the "u" of the "but." In yet another test, a passage of writing contained the words "national" and "character." These collectively were taken

—in the complexity and haste of the task—as constituting “patriotism.”

Besides such liability to both omissions and downright errors, the processes involved in the understanding of language suffer from widely varying degrees of incompleteness. As an extreme case, already suggested by Bolzano, the comprehension of the purport of “the-root-of-two” is capable of infinite development beyond anything that ever actually enters into the consciousness of any person. From these and cognate considerations, the cardinal pedagogical conclusion may be drawn, that even what seems to be the mere comprehension of the purport of language (that is, as distinguished from any reflections on or elaborations of this purport) may under varying conditions—such as different speeds of reading or hearing, altering degrees of concentration, unequal grades of ability, and so forth—involve greatly varying quantities and even qualities of cognitive process.

Analysis of Expression. After thus—all too summarily, it is feared—examining how the mind passes across from the single words to the entire thought, only a still briefer notice can here be allotted to the reverse passage from the entire thought to the single words; our problem changes from that of linguistic comprehension to that of linguistic *expression*.

In this latter kind of performance, the speaker or writer has to comply with numerous conditions, such as rules of syntax, canons of style, appropriateness to the assumed knowledge, temperament, and status of the person addressed, satisfaction to his own purposes, relief to his own emotions, and so forth. But every one of these conditions involves at bottom a more or less complex relation; compliance with them must therefore, and does, take the form of educating correlates (pp. 103-104). By means of education, it is, then, that the thought becomes converted into a shape suitable for language; by this means, some item is picked out to furnish the grammatical subject, another the verb, and so on.

But in order to become finally effective, all this shaping of the thought must satisfy yet one more condition; the appropriate items in it must needs evoke the corresponding *words*. Any difficulty in this final and merely reproductive process is apt to have a repercussion upon the preceding processes of eductive nature; the thought that fails to elicit the needful supply of words is obliged to be transformed into such a shape as does show itself capable of effecting this. In general, this will necessitate introducing further eductive processes; that is to say, the attainment of the required purport will need still more extensive usage of constitution, supplementation, and particularly indication.

To illustrate this, let us take the case that a person is being tested as to his power of recognizing the nature of a solution of quinine. As net result of the above described interplay of conditions, the testee's response will in ordinary circumstances reduce itself to some very simple sentence, as "It is quinine," or even "Quinine" alone. Suppose, however, that he should find himself unable to recall the key-word quinine. He now can do nothing but try to "indicate" this concept. For example, he might say, "The solution contains a common medicine so unpleasantly bitter, that one wants to rinse out one's mouth after taking it." Evidently, the evasion of recalling the word quinine has had to be bought at the price of a complex and largely eductive operation, followed by a recalling and arranging of a whole array of words and phrases. And under pathological influences, which disturb the reproduction both of the key-word and also of all the other words needful to take its place, there may ensue a strikingly imperfect execution. In this way, one of the patients in the already cited work of Head, suffering from a superficial wound in the left temporal cortex, found himself able to respond with nothing better than the following:

"Rotten to drink it. Something medicine or that. Make you drop water after it, so to take out of your mouth."

INTERPRETATION OF PICTURES

All that we have above been considering about language has some sort of counterpart in the other great medium of communication, pictures. Omitting for the present any comparison with linguistic expression and confining ourselves to that with linguistic comprehension, the latter shows a remarkable analogy with what in the case of pictures has been named their "interpretation."

Pictorial Tests. The confronting of these two operations has the greater interest because of their being the chief rivals as tests of the so-called intelligence. On the side of the linguistic test, particularly in the form devised by himself, there stands pre-eminently Ebbinghaus. The side of the perceptual test can boast the advocacy of Binet, whose favourite procedure was to exhibit a drawing and put the simple question, "What is it about?" That child was judged to be intelligent who "interpreted" the collective meaning of the picture, instead of merely "enumerating" the separate objects in it. This test was not only regarded by Binet as the best of all he had invented or tried, but was introduced by him into his well-known series no less than three different times, it was taken to be equally suitable for the widely different ages of 3, 7, and 14 years. Not even the details of procedure were varied.

Curious to relate, however, whereas subsequent quantitative investigation has strikingly endorsed the claim of Ebbinghaus, it would appear to have altogether upset that of Binet. Interpretation of pictures in the manner just described has proved to be, not the best of tests, but among the very worst. In one notable instance, on being applied to two groups of children carefully selected as having their intelligence normal and retarded respectively, 74 per cent. of the former passed successfully and 76 per cent. of the latter!¹ In the much more extensive and thoroughly reliable work

¹ Brigham, "Diagnostic Value of Some Mental Tests," *Psych. Mono.* xxiv. whole No. 102, 1917.

of Burt, this test is again found to be "surprisingly poor."¹ Much of the failure, no doubt, is due to the faultiness of Binet's procedure in detail. But even when this has been as far as possible amended, still the test never approaches the success so universally achieved by the linguistic one of Ebbinghaus, not to mention such further linguistic ones as the Analogies and the Opposites. Moreover, pathology also, instanced once more in the work of Head, would appear to show that the greatest injury to the power of interpreting pictures need not necessarily be accompanied by very obvious defects that can plausibly be called intellectual.²

Constitutive Processes. Now, when this pictorial interpretation is submitted to analysis on lines similar to those just employed for the understanding of language, the merely "constitutive" processes prove to be much reduced in importance. And this is easily explicable. The first condition for their occurrence is that some relation should be given separately from one or both of its fundamentals (p. 114). But this can only happen in the case of word-meanings, not in that of any perceptual objects. In the latter case, any such isolated relation, that has to be applied to a fundament given in the picture, can only be introduced from outside of the picture (or at any rate, from some other part of it). And when such an introduction does occur, it is in general only utilized for indicative, not constitutive, purposes. For instance, a man depicted as pointing in some direction suggests by associative reproduction his being interested in something over there; from these two data, the man and his relation of interest, there is at once an eductive indication of some interesting object. Such eductive-indicative procedure is skilfully employed in the pictorial tests of Thorndike mentioned on page 128.

Indicative Processes. In general, then, the mental set which directs a person's cognition in the case of interpreting pictures or other scenes has not primarily a constitutive but an indicative bent. Even indication, however, has in the

¹ *Mental and Scholastic Tests*, 1921, p. 204. ² *Brain*, xliii. 1920, p. 144.

case of pictures a comparatively narrow scope. It only takes place, as a rule, by way of the causal class of relations. Thus, one of Binet's pictures represents a man and a boy looking unhappy and dragging a rickety cart piled with broken-down furniture. To cognize this much would usually be taken as falling under the category of mere "enumeration." What is added to this by the "interpretation" consists in the general cause of the event, namely, that these people have been expelled by poverty from house and home.

Moreover, even within the causal class itself, the indications concerned are only to a small extent genuinely noetic (p. 61). In the example just quoted, the interpretation does not seem to derive so much from the intrinsic nature of the given items, as from particular remembrances somehow connected with them. And these latter, too, are of such a kind that different people might well have them in very unequal degree. The interpretation could probably be supplied easily enough by even a stupid child who had frequented the Parisian quarters of the poor; and yet it might puzzle even a clever one who had been brought up in the seclusion of a rich chateau. Contrast with this the linguistic indication given by the meanings of the words "last but two" (p. 122); here, a fair chance of success would be afforded even to a newly arrived visitor from Mars.

Exceptional Operations. Nevertheless, this smallness of scope for educing correlates in the case of ordinary pictorial or other visuo-perceptual interpretation does not preclude such scope from widening again in the case when the visual percepts are submitted to special treatment.

This happens, for example, in the employment of a map. Here, an eduction of correlates becomes needful in order to realize the effect that the relations represented on the minute scale of the paper will eventually have when transferred to objects on a vastly larger scale. Similarly, the buyer of a new instrument may have to realize how the procedure represented diagrammatically in the printed directions will act when applied to the instrument itself.

Much the same is apt to occur even in the case of advertisements; for here the prospective customer tries to realize the advantages and disadvantages that the advertized article would offer under the conditions of entering into his own possession.

In the case of mental testing, the noetic scope can be made much more extensive still, if the treatment and even construction of the visual objects is allowed to become frankly artificial. In this way, the great deficiency of the percepts, that of not supplying relations isolated from their fundaments, has been to a large degree remedied, notably by K. Gordon and Thorndike,¹ in the pictorial tests modelled after the linguistic Analogies. And probably, there remains in this direction a very fruitful field still to be exploited.

¹ *J. Applied Psych* iii 1919.

CHAPTER IX

QUANTITATIVE PRINCIPLES

THE FIVE PRINCIPLES.

Preliminary Considerations. Mental Energy. Retentivity (Inertia, Facilitation, Association). Fatigue. Conative Control. Primordial Potency.

ANOGENETIC PROCESSES.

Reproduction. Disparition. Clearness-Variation. Pseudo-processes.

THE FIVE PRINCIPLES

Preliminary Considerations. So far, there have only been considered the three principles—one experiential and two eductive—which we have been naming “noegenetic” (p. 61). These three, as the latter name is intended to signify, claim to comprise all operations that possess both a noetic and a generative virtue. By noetic is meant any cognitive transition that is valid self-evidently. By generative is meant any bringing of an item into awareness by a process which does not postulate it having been there before. These two virtues, noetic and generative, would appear to be inseparable.

Now, however, we pass on to another system of principles which are of a basally different kind. These, although enjoying equal or even greater generality, are nevertheless subordinate, in that they no longer prescribe the nature of cognition (neither “form” nor “material”), but only the degree in which cognition of already prescribed nature actually occurs. They may be said to govern cognition, not in respect of quality, but only in that of *quantity*.

Full treatment of the issues raised by these quantitative principles will as far as possible be reserved for subsequent works ; into the present one will only be introduced sufficient mention to round off the treatment in respect of quality. Moreover, it must frankly be conceded that as regards these further principles our present information is still far from complete. Whereas the three of quality would appear to be fixed irrevocably (except, of course, for corrections in detail), the following of quantity offer a good prospect of being eventually amended in a radical manner. Despite this, their importance seems more likely to suffer from under than from over-estimation. Put forward here in nakedly abstract formulae, they run no small risk of being, either rejected as arbitrary dogmas, or else—and more probably—depreciated as idle platitudes. With greater justice, such abstract formulations, even when only quantitative, may be taken to resemble the jar found by Scheherazade's fisherman, inasmuch as each of them hold confined within its narrow dimensions a genie really capable of extending illimitably. Not a mental event can occur, from the highest down to the most familiar, but that its explicability, and to a large extent even the practical control of it, depend ultimately upon its being reduced to such seemingly platitudinous abstractions.

Between the two systems of principles, primary and secondary, qualitative and quantitative, generative and non-generative, noetic and anoetic, there would appear to exist yet another remarkable contrast, namely, as regards their psycho-physical aspects. In the case of the primary and qualitative principles, all physical considerations retire to the background. The three great passages, from the lived experience to the apprehending of it, from the presenting of fundamentals to the educing of their relation, and from the presenting of a fundament with a relation to the educing of the correlative fundament, all these three we have discussed without making any allusion to their physiological counterparts, without feeling a need for any such digression,

and even, it must be admitted, without seeing any near prospect of obtaining in such way any genuine illumination. The psycho-physical connection remains as utterly mysterious in respect of these qualitative principles as in respect of the general fact that mind and matter are conjoined at all. All this, however, is completely reversed on turning to the secondary or quantitative principles. Here also, indeed, a definite line can and should be drawn marking off the mental from the physiological. But for consideration to be confined to the mental side of this line becomes, not only very difficult, but grievously disadvantageous. The fairest promise of explanation seems always to lie, rather, on the other side of the line. And even when—as, in fact, commonly happens—the amount of relevant physiological information hitherto definitely ascertained is small, even then the physiological standpoint, highly speculative though it must necessarily be, would still appear the more illuminative and progressive.

Mental Energy. The first of these quantitative principles to be now stated runs as follows. *Every mind tends to keep its total simultaneous cognitive output constant in quantity, however varying in quality.*

Hereby, we arrive once more, but along a quite different route, at the very same theory as was reached much earlier in the present work (p. 4), that of Two Factors, the one referring to general quantity, the other to variation of quality.

By virtue of this quantitative principle it is, that those of quality are originally set in action ; for if there is obliged to occur any prescribed amount of output, this must necessarily flow in some or other of the possible processes ; hence every normal person is continually apprehending experiences, educing relations, and educing correlates. As for the said constancy, this manifests itself in the fact that the occurrence of any one process tends to diminish the others, whilst conversely the fact of any one process ceasing tends to augment the others.

Such quantitative constancy of total output has not only an extensive, but also an intensive, aspect. That is to say, not only does one process hinder others, but it does so the more strongly according as it is itself the more intense. The total output must therefore be regarded as consisting of a mathematical product, extensity multiplied by intensity. The analogy thus offered to the energy of modern physics seems sufficiently striking to warrant us in using the convenient term of "energy" in the case of mind also. But if this term be adopted, we must remember that mental just as much as material energy is incapable of acting in a vacuum. There is absolute need of the supplementary concept of a system of psychical, or at least psycho-physiological "engines" into any one or more of which the energy can alternatively be diverted; for the theory to be rational, this second factor is as necessary as the first. On the psychological side, a different engine must be allowed for every different kind of mental operation. On the side of physiology, such engines can very plausibly be taken to consist in different groups of cerebral neurons. But here we must stop; all further consideration of this analogy between mental activity and material energy, including both its fruitfulness and the danger of its being exaggerated, will have to be left for a subsequent occasion.

Retentivity. Our second quantitative principle may be called that of retentivity. Even more obviously than the previous one, it appears not to be restricted to cognition, but to extend to mental processes of almost all sorts. It even governs an immense number of purely physical events.¹ Confining ourselves for the present, however, to its cognitive application, it may be formulated as follows: *The occurrence of any cognitive event produces a tendency for it to occur afterwards.* The question that naturally arises as to whether this influence affects the "energy," or the "engines," or both, cannot be examined here beyond remarking that on

¹ See the interesting parallelism traced out by Piéron in his *Évolution de la Mémoire*, 1910.

first sight at any rate the influence would appear to extend to *both*. And much the same may at once be said in respect also of the remaining quantitative principles.

The manifestations of this principle of retentivity are divisible into at least two different sorts. The one may be summarized as *inertia*; it is to the effect that *Cognitive events always both begin and cease more gradually than their (apparent) causes*.

Exceptionally striking examples are the phenomena of "perseveration," "set," and pathological "complexes." But in less conspicuous degree, the same principle permeates all cognitive processes whatever. It even extends its manifestations down to non-cognitive levels, being especially noticeable in the gradual rise and fall of sensory intensity, as also in the latency and the after-discharge of reflexes. From the physiological standpoint, it would appear to depend largely on some excitement which persists residually in the neurone after cessation of the processes that originally excited it.

The other way in which the retentivity displays itself is as *facilitation*: *cognitive events by occurring tend to re-occur more easily* (that is, in greater degree, or at greater speed, or with weaker excitant). Here lies the real key to at least two basal problems. The one, vital for theory, is that of psychic and psycho-physiological "dispositions," "traces" or "engrams." The other, bearing cardinally upon ordinary life also, is that of "formal discipline." Secondary to these, but still of wide and intense interest, are the questions as to how the facilitation accumulates (shown in practice curves and their plateaus), how it decreases again with lapse of time, and how it is modified by such conditions as the subdividing of tasks, the spacing apart of repetitions, and so forth.¹

No more than a particular aspect of the law of facilitation, but possessing such special features that it can with con-

¹ For a good summary of what is generally known on these matters, see the *Psychology of Learning*, by Pyle, 1921.

venience be treated independently, is the law of *association*.¹ This may be worded to the effect that, *Cognitive events by occurring in company tend to do so with greater ease*.² Physiologically, a widely accepted but still very dubious doctrine would attribute this chiefly to some breaking down of resistance in the neural synapses. We encounter here the same psychological problems as with facilitation in general, but enriched by additions from specially applying it to the case of reproduction. In this way arise all the questions as to the nature and conditions of the linkage formed between the reproducing mental item and the reproduct.

Fatigue. Our third quantitative principle is that of *fatigue*. It is almost the reverse of the last one, since it may be formulated as follows. *The occurrence of any cognitive event produces a tendency opposed to its occurring afterwards*. In this fashion, the effect of earlier upon later mental events is rendered scientifically intelligible, not by regarding it simply as a whole, but by resolving it into two different and even contrary factors. A similar analysis, as is well known, has been found necessary in many other branches of science. The manifestations of electricity, for example, have been split into positive and negative; the interaction of material particles, into attractive and repulsive; ethical values, into good and bad. Physiologically, there are probably several very different contributory causes, such as the consumption of neural tissue, the formation of toxins, the excitement of inhibitive influences, and so forth.

Among the problems arising from this fatigue is its connection with such manifestations—often also called "fatigue"—as weariness and neurasthenia. Other problems run parallel to those just mentioned in respect of retentivity.

¹ Still unsurpassed as a general account is the *Association des Idées* by Claparède, 1903.

² We may note here one more equivocity of the popular doctrine of "learning by experience." For these words, in addition to the two meanings given on p. 36, are also often taken to mean simply facilitation by practice.

They are chiefly concerned with how far one kind of mental operation produces fatigue for another more or less similar kind, or how the fatigue accumulates with the duration of its cause, or how it diminishes again with lapse of time, or how its intensity is affected by any further conditions. Of particular difficulty is the question as to how far its influence is general or specific; in other words, how it affects the mental "energy" and the "engines" respectively.¹

Conative Control. As a fourth quantitative principle, it may be laid down that, *The intensity of cognition can be controlled by conation.*

The most striking case is where a person deliberately "turns his attention," as it is said, from one item in his cognitive field to another. Here, the initial state of the awareness of the second item is faint. Then a conspicuous conation ensues that this awareness should become as intense as possible. Finally, such an intensification actually happens (with counterbalancing loss of intensity in the first item).

But there must also be taken into account the cases where the conation is weak and obscure. This happens, in particular, with regard to the greater portion of such noticing as is due to habit. Here, not only the conation but also the ensuing increase of clearness may be inconspicuous, although nevertheless important; the part of the cognitive field affected may lie wholly in the background of consciousness.

In respect of the precise scope of such conative influence, this is a matter only just beginning to pass from exclusively speculative handling to experimental inquiry. No information appears to have been obtained yet even as to whether the influence is limited to a bare clarification, or extends to the noetic transition also. The problem is analogous to the familiar one, as to whether the act of willing to move has for sole immediate effect an intensification of the idea of

¹ This problem concerning the generality of fatigue is akin to that of "intelligence" (p. 5). The latest results appear to be those obtained by G. P. Phillips (*Records of Education Society*, Teachers' College, Sydney, 1930). A further contribution may be shortly expected from S. Philpott.

movement, or can dispense with any such mediation and produce the movement in a more direct manner. Another important problem still unsettled is as to whether the conative influence is always primarily enhansive, or can also be (directly) inhibitive. Yet another moot point is as to whether not only conation, but also affection, possesses such immediate influence in the regulating of cognitive intensity.

As for the physiological aspect, this is still extremely obscure; the conative processes may perhaps be credited with a certain power of attracting the cerebral energy towards the particular system of neurons which they involve.

Finally, it will be remarked that this principle brings to simple scientific expression, and therefore prepares for exact scientific investigation, the main facts furnishing the bases of the theories of Freud and Jung.

Primordial Potencies. The preceding principles are still incomplete. Although they all express quantitative tendencies, none determine finally the quantitative degrees. Still less do they furnish any account of how such degrees vary from person to person, and even from time to time for the same person. One man may excel another in total output (involving his amount of disposable "energy"), or else only in output of some special kind (making calls upon the efficiency of his corresponding "engines"). So, too, one may possess a superiority in retentiveness of any particular kind, or of any group of kinds. Similarly, as regards fatigue. Similarly, once more, as regards his cognitive processes being more or less perfectly under the control of his conation. In such variations, of course, is situated the great domain of mathematical correlations.

Now, it is desirable to be able to express all these basal quantitative factors in a quite general way, so as to become independent of any still precarious physiological hypotheses, and even, when desired, of the physiological aspect altogether. For this purpose, we may regard these underlying factors simply and solely as such. In such a way, we arrive at the fifth and final quantitative principle. *Every manifestation*

of the preceding four quantitative principles is superposed upon, as its ultimate basis, certain primordial but variable individual potencies.

ANOEGENETIC PROCESSES

The quantitative principles not only regulate the amount of all three noegenetic processes, but also bring about some processes of their own. These are "anoegenetic," in the sense that they neither have the nature of self-evident propositions nor generate any new items in the cognitive field (p. 61). There does not exist, however, as in the case of noegenesis, one process specially and exclusively derived from each quantitative principle. Instead, there only occur three further simple processes, and they from the five quantitative principles jointly.

Reproduction. The first of these three anoegenetic processes consists in the case where items are brought into the cognitive field in a manner which postulates their having been there previously; in a word, this process is one of *reproduction*. It was already analyzed, and with astonishing profundity, by Plato; he exemplified it by the fact that seeing a lyre may recall the idea of the person who customarily played thereon.¹ In modern language, the sight and the idea had been in mental "contiguity." This same case must include, be it remarked, those instances—often overlooked—where numerous but small items are reproduced simultaneously and gradually; such manner of occurrence is analogous to that which was described as "diffuse" in the case of noetic activity (p. 84).

Commonly, all such reproduction is taken to be completely explained by association. But this view would appear to be too facile. Association is a clear and valuable concept only when taken as a pure corollary to the principle of retentivity (p. 132). And bare retention cannot possibly account for ideas ever re-appearing when once they have ceased to exist. In order to bring them back to existence,

¹ *Phaedo*, 73 D.

some further influence must intervene. The associative retention can only explain why, *when* some item or other must be evoked, it should preferably be of one particular kind, namely, a former companion of what is in consciousness at present. So much and no more explanatory virtue can legitimately be credited to retentivity as manifested in association. There has still to be sought, then, the ground why any item should be evoked at all; and such ground must be traced to quite another principle, that of mental energy (p. 131); for this energy must needs flow into some engine or other; the associations only help to decide which. A subordinate ground appears to be furnished by the principle of fatigue. This latter is continually causing many items to be eliminated from consciousness; and the constancy of the output necessitates further items being evoked in their place.

Reproduction may occur, not only as considered above by way of contiguity, but also by that of resemblance. Plato gave an example of this also; it was the fact that a picture of Simmias could recall the idea of Simmias himself. The great majority of psychologists take such cases to be no more than an easily explicable variety of the reproduction by contiguity, both alike being therefore derived from association. By these authors, resemblance is in general regarded as simply consisting in the possession of some common component. Thus, the picture of Simmias might be represented by *c-a*, and the idea of Simmias himself by *c-b*. When *c-b* reproduces *c-a*, this event is taken to be merely the *c* of *c-b* recalling its former associate *a*. Such an easy explanation would, no doubt, be very desirable; but on probing the matter more deeply, unsuspected difficulties reveal themselves. In the present work, the principle of retention will, indeed, be accepted as chiefly responsible for both the reproduction by contiguity and that by resemblance; but we shall not assume that either sort of reproductivity is reducible to any variety of the other.

Disparition. The remaining two anogenetic processes can

be disposed of very briefly. One of them is not constituted by any apparition of items in the cognitive field, but on the contrary by any disparition from it. An obvious influence in this direction comes from the principle of fatigue; by virtue of this, all items after rising into consciousness must forthwith tend to sink out of it again. In resistance to this tendency works the principle of retentivity. And equally liable either to support or to resist it, is the principle of general mental energy.

The process of disparition, together with the preceding one of reproduction, are the two great causes of mental disintegration. All original cognitive generation, as we have seen, takes place solely in the form of complexly constituted units, just as physical organic growth consists ultimately in distinct and complexly constituted cells (p. 59). But subsequently the retentive tendencies proceed to act upon the constituents of the generated units in unequal degree, so that some of these constituents outlive the remainder and thus come to exist disintegrated from it.

A notable instance is the bare presentation of mental objects, so emphatically declared by Brentano to be one of the three basal acts of mind.¹ By the present analysis, we find that *originally* cognition is always generated in highly complex units which include much more than bare presentation of objects; but afterwards, any constituents of such a unit can be either retained or reproduced separately. In this way, bare presentation proves to be really no unit of mental growth, but a mere product of decomposition.

Clearness-Variation. Only one more cognitive process is even conceivably possible. The first three have accounted for all apparition of items that may be new. The fourth, for all apparition of those that must be old. The fifth, for all disparition of any kind. There is only left over, then—if it is to constitute any genuine process at all (p. 58)—such continuous change of cognition as is compatible with all the items remaining the same. Accordingly, the change must

¹ *Psychologie vom empirischen Standpunkte*, 1874, bk. ii. ch. i. § 2.

be restricted to that of *clearness*.¹ Popularly expressed, our final process must be cognate to a mere shifting of "attention."

Very rare, however, seems to be the occurrence of this sixth process in absolute perfection; almost always the items in the cognitive field, far from remaining steadily the same, are perpetually being both augmented and diminished. Still, occasions where the additions and subtractions are comparatively small, and where consequently there is at any rate some approximation to this final kind of process, do occur frequently and have large importance. Of such approximative nature are, in particular, the processes which we have called "explorative" (p. 102).

Pseudo-processes. A word may be appended on the real nature of certain further commonly alleged processes. One such is "differentiation." Really, this is no special process in itself, but only a general character appertaining to all processes whatever, in so far as the items generated by them at any moment happen to differ from any that occurred before.

Another frequently asserted process is that of "analysis." But in truth this word only denotes the resolving of any mental aggregate—a state of consciousness, a process, an operation, a concept, and so forth—into its constituents. It therefore does not signify any specific process, but instead an achievement. It is applicable to all operations, however diverse, which happen to terminate in a particular class of practical results. In so far as the word is ever applied to simple processes, it seems merely to signify an awareness of difference. Thus, a clang of several tones is said to undergo analysis, when it becomes apprehended more and more distinctly (see p. 158).

Still less tenable is the alleged converse process of "synthesis." Sometimes this term is applied to what we here have called the eduction of relations (it cannot pretend to cover that of correlates). But even this much is false; for

¹ For an analysis of this concept, see later (ch. xi.).

synthesis would mean a mere "placing together" of the fundamentals; whereas the eduction is really the generating of an intermediary between them (p. 63). Noegenetic process is not analogous to carpentry, but to the cellular growth of plants and animals. As for the manifold other meanings that crop out occasionally and almost always equivocally in the term synthesis—such as simultaneousness of occurrence, linkage by association, assemblage into classes, logical reference, mental chemistry, mere confusion, real union of attributes to their substances, and so forth endlessly—their motley variations seems sufficient ground for denying to the term in its ordinary usage any serious scientific import at all.

We are left, then, with only six genuine simple processes altogether, three noegenetic and as many anoegenetic. They exhaust the whole domain of cognitive activity. Reduction of mental events to these six would appear to furnish the most universal and fundamental task of all cognitive psychology.

CHAPTER X

REPRODUCTION AND CORRELATE-EDUCATION

DISTINCTION.

Limitation by Previous Experience. Limitation by Intrinsic Nature.
Secondary Distinctions. Genetic Kinship.

COMBINATION.

Eduction-reproduction. Evocation of Similars. Modifications and Complications.

EVIDENCE OF INTROSPECTION.

An Objection. Auras. Prodromes. Inference.

DISTINCTION

HAVING delineated the quantitative principles in general outline, we may now proceed to examine a special difficulty which they introduce. It lies in the fact that one particular process derived from them, namely, the reproduction of associates, is extraordinarily apt to be confused with one of the basal noegenetic processes, namely, the eduction of correlates. How to distinguish these two cases is worth considering with great care.

Limitation by Previous Experience. Contrast, first, these two in respect of limitation to the person's own previous experiences. In the case of the reproduction, this limitation is absolute. To any extent, however slight, that an item evoked in mind departs from the range of that experience, to such whole extent it is no longer a mere reproduct; any attempt to explain it solely by reproduction is a contradiction in terms. Far otherwise, in the case of educating a correlate. Let, for example, the given fundament be any point in space, whilst the given relation is that of x miles in y direction. Then, clearly, the correlate may, according

to the values of x and y , be any place at all, however unnoticed or unconsidered by any one previously. Or take the case of sensory quality; let the given fundament be a particular green, whilst the given relation is that of some definite differences in respect of chroma, saturation, and brightness. The correlate is again free from any restriction. Quite analogous is the case of tones and their harmonic relations.

Indeed, if we abstract from the merely practical limits imposed upon the correlate-finding by the more or less accidental weakness of human minds (see our fifth quantitative principle (p. 136), and if we regard, rather, the intrinsically potential range of this process, we become impelled to accept this range as being much more extensive still. Apparently there cannot exist in the entire cosmos any two constituents which are not definitely interrelated, in respect of both likeness and reality. If that be so, then the presentation of any one constituent plus that of the appropriate relation are potentially adequate to generate the awareness of any other constituent whatsoever. Thence it follows, too, that to understand any single thing whatsoever in its own entirety, in all its relations, and in all that can be noegenetically educed from these—to do this would be to understand the whole Universe. Nothing else, perhaps, was meant in the well-known lines :

“ Flower in the crannied wall,
 I pluck you out of the crannies,
 I hold you here, root and all, in my hand,
 Little flower—but *if* I could understand
 What you are, root and all, and all in all,
 I should know what God and man is.”

Limitation by Intrinsic Nature. But whilst in this manner the range of previous experience, although imposing its limits most rigorously upon the possible range of reproducing, does not do so at all upon correlate-educing, there is another factor which has just the reverse influence; it leaves the

range of reproducing unlimited, but inexorably limits the educating of correlates. This further factor consists in the intrinsic *nature* of the evoking items. Between this and the nature of the evoked item there is in the case of reproduction no necessary connection whatever; anything of any nature can call back to mind anything of any other nature. In point of fact, the reproductive tendency due to association would appear to irradiate towards all other items ever cognized before; for there is probably some degree of association, direct or indirect, between all of them, just as by some route or other there is an eventual connection between all the cerebral neurons. The reproductive upshot, then, lies at the mercy of merely quantitative influences—and most changeable ones—such as frequency of repetition, recency, vividness, perseveration, etc. (see last chapter). But in the case of educating a correlate, all this is quite otherwise; here, the nature of the evoking data leads only to one single self-evidently determined issue, that and nothing in the smallest degree different.

These two so contrasting cases may, for lucidity, be illustrated by the same example as has served so often before. Compare with one another the respective processes involved in answering the two questions: "What is the opposite to 'good'?" and "What does the word 'good' call to your mind?" Clearly enough, the answer to the first question is rationally quite determined by the nature of the evoking ideas "good" and "opposite to"; so long as these remain what they are, the noegenetically evoked answer cannot possibly be the least other than the idea denoted by "bad." But with the second question, the contrary obtains; the idea evoked does not suffer the smallest rational determination by the nature of the evoking item "good." So far as this nature is concerned, the item evoked may be anything at all, from "shoes and ships and sealing-wax" to "cabbages and kings."

Secondary Distinctions. To this primary and double-edged distinction between the two cases in respect of limitation,

there could easily be added numerous and important distinctions of secondary order. One of these is in respect of speed. Speculatively it might have been expected that to seize upon the first-coming idea with any reference at all to "good" would be a far quicker operation than to go hunting for the particular idea which has the very special reference to it of contrariness. Actually, however, the more special quest is the quicker of the two; in general, easy correlate-finding is effected with greater speed than the so-called "free association." Another not uninteresting distinction is that, whilst the correlate-finding has been shown by experiment to have a high correlation with estimates of "general intelligence," all mere reproduction exhibits low correlations with it.

Such distinctions from the noegenetic class of evocation may usefully be further examined in respect of the kind of reproducing known as "recollection" (see also Ch. XIX.). Keeping to the same example as before, consider the process of answering the question, "Where did you last notice anything to be 'good'?" Again, as with the associative so too with the recollective reproduction, the correct answer is not at all determined by the nature of the given items, but wholly so by the course of previous experience. As regards the time required, this is probably even longer than in most cases of associative reproduction. Further, there would now appear to intervene a new phase of primary importance. This is neither an eduction nor a passive waiting, but consists in multiple reproductions, from which, then, a more or less careful selection is made. As regards correlation with "general intelligence," this is again usually very low.

Akin to such operations of recollecting experiences is that of recalling information, as typified in answering the question, "Whose professional business is it to teach what is good?" Clearly, the power of answering is once more derived, not from the bare nature of goodness, but from previously acquired information about such people as preachers, schoolmasters, and so forth. Accordingly, this recalling of information is distinguished from the finding of correlates by all

the same characteristics as we have been noting in the other reproductive cases.

Genetic Kinship. Notwithstanding that the two processes educative and reproductive, stand out so sharply profiled in themselves and so radically distinct from each other, yet in respect of genesis they lie very near together. Experimental research shows that, although association does not (as has been so unfortunately assumed) furnish an adequate account of the cognition of relations, nevertheless the latter process does, inversely, go far towards explaining the former. For it has been discovered that an association is set up between any two cognitive items when, and only when, some relation is cognized between them.¹ Hence, it would seem as if the intimacy of contact needed for linking them as actual occurrences derives from their being apprehended as related (mental) objects; otherwise expressed, the quasi-mechanical reproductive *adherence* has its source in the *noetic coherence* (p. 58).

Suppose, then, that any person has at some previous time apprehended any two items as mutually related. Consider what can ensue when the same person happens to present to mind one of these two items again, but now alone. As the immediate result, the previously presented relation may be re-evoked; and for this purpose, nothing can possibly serve except a process of reproductive kind. But when once this much has been effected, then *either* a reproduction, *or* an eduction, *or both coincidentally*, can proceed to re-evoke the other of the two previous items. No better instance could be given than our familiar one of "the opposite to good" evoking "bad."

In consequence of these possible alternatives, the psychological analysis often becomes extremely difficult. For whenever any item arising into consciousness may possibly—

¹ This fact may be gathered especially from the investigations of G. E. Müller. In the same sense may be interpreted the results obtained in our own laboratory by Dr. Wohlgemuth on the "Direction of Associations" (*Brit. J. Psych.* v. 1913). Indeed, the view already comes to remarkably clear expression with Augustine (*Confessions*).

for all that is known—have been there before, in such case no proof remains (beyond certain subtle evidences of introspection) to show what share in the operation should be credited to reproductive and what to educative influence.

COMBINATION

Besides being thus able to coincide with each other, there is no reason why the two processes, eduction of correlates and reproduction of associates, should not also occur in immediate sequence. And this, in fact, would appear to happen even with our typical instance, "the opposite to good." For here, although the educative process is able to explain the genesis of the *notion* of "bad," there is yet need of a reproductive process in order to explain the final evocation of the *word* "bad."

In this particular instance, (as in almost all evocation of words), the reproduction is by means of what has been called "contiguity" (see p. 137). But just as easily, a reproduction following thus hard upon an eduction can be of the other sort, viz. by similarity. And here belongs the very important case of calling to mind an example or illustration. Thus, on a person being told to mention "some attribute that is the opposite to good," he will normally be able to give some such reply as "villainous." Now, he can effect this by taking two distinct steps. The first is that the meanings of the individual words evoke their collective purport (p. 148), this purport contains only the same very general notion that would be evoked by words like "some-bad-attribute"; the process is strictly *educative*. The second step is that this very general purport goes on to evoke the much more specific notion of "villainous," which furnishes the required example; *this* process is *reproductive*, and of the sort due to similarity.

Such two-step operation can be extended to a great number of other cases. It embraces all those where a fundament together with a relation jointly bring forth any notion that in any respect is *not* educible self-evidently from

their own intrinsic natures. Just the same explanation covers, in particular, many cases of "error" (Ch. XVII.). This happens, of course, with great frequency in mental testing; numerous examples are to be found in the preceding chapters.

As will now readily enough be seen, the class of evocations here examined comprises by far the greater portion of what are commonly named "controlled associations." Familiar instances are the finding of a part to a given whole, of a species to a given genus, or of an effect to a given cause, and in each case also *vice versa*. In such cases, the name of "controlled association" is to some extent justified; for the earlier and educative step does exert a "control" upon the influence of association, inasmuch as it supplies a cue whereby, in the second step, some particular associative connection is brought into functional activity. The chief ground for surprise about the name is that it did not actually arise out of—or even apparently lead to—any recognition that two such disparate steps are both involved.

Evocation of Similars. Another case belonging to the educative-reproductive class, but offering peculiar difficulties of its own, is when a person has the task of calling to mind some item "similar" to one given initially.

Now, since similarity is a relation, the understanding of what is indicated collectively by such a set of words as "similar to good" must necessarily be a case of educating a correlate. This indicated meaning can be trenchantly distinguished from that which is merely "constituted" (p. 118); for it no longer contains any notion of similarity, whereas that which is merely constituted does. If one tried to coin a single word that would in any degree express this indicated meaning, one would be driven to devise some such verbal form as "goody." The attainment of this very general notion is, then, the first step and is achieved educatively. But next, there can be evoked a more specific notion reproductively, such as that of "virtuous" or of "advantageous."

In itself, the form of the second step, by which the "goody" evokes the "virtuous" is manifestly just the same as that by which on the preceding page the "bad" evoked "villainous"; in either case, it is simply a reproduction by similarity. The ground for puzzlement in the case of "virtuous" is that here exactly the same notion might equally well have been reached along another and more direct route. For if it was amenable to being reproduced by its similarity to "goody," then why should it not have been straightway reproduced by its similarity to the initially given "good" itself? And if the two ways of achievement are in actual fact indistinguishable, then why not adopt the simpler of the two as the explanation?

To this must be replied, that the existence of the direct route does not abolish that of the indirect one, and that the two procedures do admit of being distinguished. Among the criteria marking the difference is the fact that the more direct way of reproduction by similarity has, as is well known, a comparatively small percentage of occurrence. Thus, if a person simply utters whatever is first evoked in his mind by the notion of "good," this will in the majority of times by no means be anything similar, as "virtuous," "advantageous," etc.; more likely, it will be some such word as "conduct," "food," or even "bad." Whereas, if he intentionally exerts himself to think of some character similar to good, he can do so without fail every time.

There remains still one nicety that cannot well be overlooked. It is that even in the case of the indirect route, we are bound to ascribe at any rate the final step to a direct reproduction by similarity. Hence, the infrequency just said to be characteristic of such a kind of reproduction must—one might naturally think—make its appearance here also. This difficulty would seem to find its solution in the fact that the notion which we have so inadequately tried to express by the word "goody," possesses in truth something rather more than a similarity to "virtuous," "advantageous," and so forth; as presented to mind, it forms an *integral part* of

each of these. It recalls one or other of them so infallibly for much the same reason that the part word "water-" is almost certain to recall some complex including it, as "water-cart," "water-colour," or "water-ice," although the self-sufficient and isolated "water" would not be at all certain, or even very likely, to have any such result.

Modifications and Complications. So far, we have been considering the case where an educative process is immediately followed by a reproductive one. But this order of sequence can be reversed. Here belong, in particular, all those cognitive operations where the relation that leads to educating a correlate is embodied in any rule (law, method, or maxim, see p. 102). For such a rule itself has need of some process to bring it to awareness; and this process will usually be an associative reproduction. For example, the sight of a deer may evoke in the hunter some associated scheme of procedure—necessarily a system of relations—for capturing it. So, too, a picture may excite an associated "set" suitable for interpreting it. Similarly, the hearing of language at once arouses an associated habit of so distributing the mental energy as to understand what is meant.

An interesting further case is where, instead of either the reproductive or the educative process preceding the other, the two occur simultaneously and act convergently. Take, for example, the task of completing the following sentence :

"The man drank the wine and soon grew so . . . that his friends could not restrain him."

The correct response must be based on at least two different tendencies. The one is to reproduce some property associated with the concept of "wine." The other is to educe the correlate required by the relation involved in "restrain."¹ As an instance of committing an error,* some of the testees filled in the gap with "sleepy." This shows that in their

¹ Obviously the second of these tendencies could be activated alone by such an instruction as "Mention some mental state that involves difficulty of restraint." Here the form of operation is just the same as was needed to "mention something the opposite to good" (p. 97).

minds only the first, not the second, of these tendencies was actually effective.

All such combinations of the eductive with the reproductive processes may be further complicated by the kind that we have called "clearness-variation" (p. 139). Suppose, for instance, that a person hears any remark and wishes to meet it with a jest. In order to think of anything humorous about it, he may find himself obliged to evoke associatively connected ideas rather profusely, and as they arise may have to submit them to more or less prolonged explorative clarification, in search of the desired humour.

Among experimental examples, the most abundant and intricate combination of the reproductive with the eductive processes has, perhaps, been attained by the test of Ebbinghaus. In this respect, however, the test does but mirror the most important biological situations of ordinary life (as was rightly claimed by Ebbinghaus himself). In these, a person very often fails to evoke at once any idea of action which finds his immediate assent. He proceeds to call up further considerations bearing on the matter. Such, for example, might be the relative values of the several possible ultimate achievements; or those of the several possible manners of carrying the latter into effect; or else the secondary results of so doing. If the situation happens to be theoretical rather than practical, he may, instead, trace out causes and reasons, and then hunt for crucial verifications of his hypotheses. All this searching, whether practical or theoretical, will bring about eductive, reproductive, and explorative processes in great multitude.

Manifold combination of the different processes is, moreover, by no means confined to such obviously complicated situations, whether experimental or natural. Often a seemingly quite simple cognitive operation—and even one effected with great speed—may really consist of eductions, reproductions and (to a slighter extent) of explorations that are sandwiched together in surprisingly numerous layers, much as may sometimes occur in physiological cell-growth, or in geological stratification.

EVIDENCE OF INTROSPECTION

Throughout this chapter, the combination of eductive with reproductive processes has always been mentioned as a route by which the given initial items could *possibly* lead to the ascertained eventual results. But such a way of looking at the matter leaves still open the question as to whether in any particular case this route is really followed or not. Can any evidence, either for or against, be obtained directly from introspection?

Auras. Our answer must be that such evidence is upon many occasions actually forthcoming. Thus, keeping still to the same instance as before, the words "opposite to good" can be adequately understood, and introspected as being so, before ever any word "bad" arrives in consciousness at all. Psychologists who at first are inclined to doubt this will often readily admit it on facilitating their introspection by means of contrast with instances where such an adequate understanding fails to occur. Such failure would happen, for instance, with the words "greater than blue." In this instance, not only the individual words, but also their inter-relations, and therefore what they collectively "constitute" (p. 114), can still be understood well enough; but there can be no understanding of anything that they collectively "indicate." The contrast between these two cases makes much more visible the character which the one possesses but not the other; with the assistance of such contrast, the processes of understanding the indicated purport may become actually introspectible as forming the first and eductive part of the operation, and as being distinguishable from the ensuing and reproductive part.

Introspective scrutiny can not only ascertain the occurrence of such a first and eductive step as we have been considering; it can to a certain extent make out its special characters as an event in consciousness. This event is of the general kind that has been called in German a *Bewusstseinslage*, or, more appropriately, a *Bewusstheit* (and has been mistranslated into English as a "conscious attitude").

It might, perhaps, be called a "sciousness." It exhibits very commonly the special character of being what in recent years has been called "tied" to the words evoking it; that is to say, its occurrence is not easily distinguished from that of the words; it has, so to speak, the appearance of an aura emanating from them.

Prodromes. Not always, however, is the apparent connection with the evoking words so close. Just now, we summoned to the aid of introspection its powerful ally, contrast. But it possesses another, hardly less powerful; this consists in the device of introducing more or less difficulty into the operation to be examined, so as to slow it down and thereby afford a better opportunity for observing its nature. Let any one try to call to mind "some particular action which is the opposite to clumsy." Here, perhaps, the purport collectively indicated by all the words will be, not only evoked, but even dwelt upon for an appreciable period, before it achieves its mission of reproducing the required particular example. In such cases of delayed response, the indicated meaning may no longer have the appearance of being closely linked or "tied" to the initially given individual words (or even meanings) out of which it arose. Instead of irradiating aura-like from any of the items already presented in consciousness, it stands out distinctly from these; it plays the part, rather, of a prodrome to ideas and words that are still lacking and can only arrive by way of reproduction (in our preceding instance, the eventual reproduct might, perhaps, turn out to be some such notion as "three card trick").

Approximating to the one or the other of these two typical forms, that is, either still clinging aura-like to the present, or else already functioning as a prodrome presaging the future, the educed correlate can in a vast number of cases be actually detected in consciousness as forming the first stage of the operation. And if the possibilities of natural introspection are skilfully eked out with all the helps that can be lent by experimental resources, there would appear

to be left over no general class of cases whatever where such detection is wholly impossible.

Inference. Nevertheless, there indubitably remains a large balance of particular instances where such an anterior cognitive step does altogether fail to be detectible. When this happens, however, then at any rate there exists no alternative explanation derivable from introspection to take its place; not even a plausible one appears ever to have been offered. If an explanation at all is desired, there would seem to be no resource other than that which has made the fortune of the physical sciences; that is to say, the events which can actually be observed must be freely supplemented by those which can reasonably be *inferred*. What physicist will not believe till he sees with his own eyes, that a molecule of hydrogen has a diameter of about $4\mu\mu$ and moves with a velocity of nearly 2,000 metres per second. The psychologist, too, we here plead with all emphasis, can and must have recourse to inference. The modern movement, which reproached the older work with replacing genuine psychological observation by mere logical reflection, certainly had a core of valuable truth on its side. But it went too far; as the German saying goes, it threw out the child with the bath. With the aid of inference, the psychologist has still a possible appeal from manifest consciousness to subconsciousness. And failing even this, there yet remains a refuge in analogously conceived processes that are *unconscious*. But with this topic we begin to trespass upon a territory which properly belongs to the following chapter.

CHAPTER XI

CLEARNESS, DIFFERENTIATION, AND SUB-CONSCIOUSNESS

CLEARNESS.

Universal Character. Rise to Maximum. Attempts at Definition. Two Constituents. Separate Courses.

DIFFERENTIATION.

Possible, but not inevitable. Regressiveness.

THE UNINTROSPECTIBLE.

Meaning of "Conscious." *A priori* Grounds for Limen. Crucial Cases. Attributes of Transition. Rival Theories. Extent of Sub-consciousness.

CLEARNESS

Universal Character. Next, we may conveniently consider cognitive growth from a more general standpoint ; having scrutinized each of the principles in turn, we may proceed to examine a feature which dominates them all. Every item in the cognitive field possesses some grade of "clearness." It stands between two poles, the one of utter obscurity and the other of perfect clarity. Its intrinsic growth always consists in advancing from the former pole towards the latter. But any position thus reached is never stably consolidated ; no sooner does the advance cease than a movement commences back again. The clearness would seem as if it were a mental configuration that is only attainable and sustainable by means of some special tension ; on this tension being relaxed, the configuration automatically lapses.

Such progressive clarification and regressive obscurification of an item of awareness, as will presently be shown, do not

occur solely, or even chiefly, in the course of long stretches of time, or in respect of different occasions. They are not confined to the great general changes that come over the human mind in passing from infancy to adolescence, and thence on to senescence. Nor is their range exhausted even by adding to these general changes the further gains and losses of clearness which befall any particular cognition through the influence of practice or disuse. Over and above these waxings and wanings from one manifestation of an item to another, there have to be considered the waxing and waning that happen to it at *every single manifestation*. Its entry into the field of cognition invariably takes the form of a gradual, though swift, clarification, starting from the extreme pole of complete obscurity. Its departure from the cognitive field is no less invariably a gradual, though far slower, lapse back again to the complete obscurity from which it originally emerged.

Rise to Maximum. This thesis will first be supported with certain experiments made recently by the writer on the briefest exposure giving the best visibility.¹

It was discovered that visual forms elementary enough to be perceived in a single mental operation attain to their maximal visibility when the exposure has lasted about one second. Quoting from the report of the investigation,

"This limit of time remains constant whatever may be the distance, minuteness, darkness, or colour of the object, whatever the darkness or colour of the background, and whatever the mistiness of the atmosphere. When any of these conditions are unfavourable, there will, of course, be a corresponding loss of vision. But this loss cannot in any degree be made good by looking for a longer time."

Graphically, the following figure was obtained, where the abscissae denote different durations of exposure, the dotted

¹ They occurred in the course of an investigation (unpublished) on behalf of the British Admiralty.

line is the intensity of physical illumination (here, one of moderate brightness), the thin continuous line is the intensity of sentience, and the thick line is the degree of visibility attained.

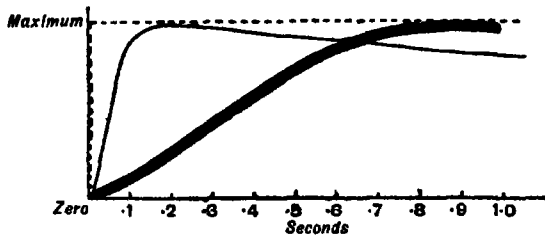


FIG 14

As regards the physical illumination, this naturally reaches its maximum with what may be taken as instantaneousness. The intensity of sentience needs in order to reach its maximum an exposure of little over .1". "The visibility does not arrive at its best unless the duration has been prolonged to about 1". If the physical illumination be decreased, the sentient intensity not only decreases in absolute amount, but also attains later to its maximum. The visibility, on the other hand, although likewise decreasing in absolute amount, does not alter the duration required for its maximum.

In thus estimating the visibility of the percept, the practical criterion employed was its capacity for being described accurately, recognized correctly, and so forth. But all these more or less extrinsic properties of the percept must depend at bottom upon the intrinsic character ordinarily known as its "clearness." Of this it is, then, that the thick line in our figure must be regarded as really depicting the dependence on duration of exposure.

Attempts at Definition. But herewith is lightly spoken a great word. For what, then, is the essential nature of this "clearness," whose varying phases constitute the inmost history of each particle of all objects as cognized on every occasion? Strange to say, although its importance has sometimes met with high (though still much too narrow)

appreciation—notably by the Stoics and the Cartesians—and although its incidental mention in psychology is extremely frequent, nevertheless the attempts to explain its own intrinsic nature have been extraordinary meagre. Even the best psychological and philosophical dictionaries pass over its definition, either in silence, or in nothing better.

And when attempts to explain it do occur, they are usually most disappointing. Sometimes it is said to consist in a perception of difference. But when we examine any actual instance, *e.g.*, as is given in our experimental measurement of visibility, the clearness is at once found to facilitate not only awareness of difference, but also that of likeness. Sometimes, instead, a mental object is alleged to become clear by acquiring more detail. But on again examining any actual instance, the emergence of new detail quickly shows itself to be altogether additional to the clarification of such detail as was present already. To call the new arrival a mere clarification is deliberately to court misunderstandings. Nor can even the view be accepted, that clarification is reducible to any separation of mental items from one another, as is implied by taking it to be an "analysis" or a "dissociation." Among the numerous reasons against this is the fact, that some degree of clearness can be found appertaining to every single cognitive item in itself; the concept of clearness involves no reference to any other item until we add to it further notions, as is done in the more complex concept of "distinctness." Yet another view is, that the clearness of an item consists in its being apprehended in relation to other items. But any apprehended relation is itself an item in the cognitive field over and above its apprehended fundamentals; each such item, whether relation or fundament, possesses a degree of clearness of its own.

For instance, the present writer is at this moment looking intently at a red surface; he sees the colour very clearly *without* at the time—so his introspection tells him—clearly cognizing any relation of it to any other colour, either sensed, or remembered, or conceived (certainly, the verbal concept

of "red" forms no inward constituent of his perception, but is only introduced for the purpose of speaking about it). But now he proceeds to compare the red with another neighbouring one; and up into his cognitive field shoots a very clear relation of similarity. On comparing it, instead, with a blue, up shoots another clear relation, that of dissimilarity this time. All through, the clearness of the red itself does not appreciably alter; the superposed awarenesses of relation, far from actually constituting this clearness, show themselves to be at the present moment—whatever they were originally—not even an indispensable condition for it.

Two Constituents. In order to attain to a truer view of the matter, it would appear necessary to realize the fact, that all experience whatever, cognitive no less than affective or conative, possesses gradation of *intensity*. When we sink into sleep, not only our feelings and willings, but also our knowings, grow weaker and weaker until they quite die away. The reverse occurs, when we emerge from sleep.¹ Now, such intensity of cognition appears to belong to the meaning commonly conveyed by the word clearness.

But then the trouble arises, that the concept of clearness certainly includes also a further idea, which may perhaps be designated with least ambiguity as degree of *determinateness*. This latter constituent of the concept of clearness would appear to be not merely different, but altogether disparate from the intensity. A startling gulf between the two reveals itself in the fact that degrees of intensity are applicable to realities whereas degrees of determinateness appertain solely to mental objects as such.² A real cognitive act is

¹ By intensity of experience is here meant exactly the same as what many writers mean by a "degree of consciousness." See especially the work of Wirth, which so happily combines profundity of thought with exactitude of experiment (*Bewusstseinsphänomene*, 1908). But, unfortunately, the word conscious has become extremely ambiguous (p. 164), for this reason it is here as far as possible avoided.

² The above considered indeterminateness of intrinsic nature is, of course, an entirely different thing from the indeterminateness of *individuality* that characterizes "universal" ideas and propositions.

always more or less intense, just as is any other experience, or a physical force. But no real entity or occurrence can ever admit of any degrees in respect of determinateness; it must be exactly of such and such a nature and exist at exactly such a particular moment, not in the least otherwise or otherwhile. This proposition is self-evident.¹

Separate Courses. But although thus conceding that the intensity and the determinateness are in themselves utterly different, there still remains to decide whether the two are capable of varying separately. In general, their respective courses of variation show themselves to be at least closely interdependent. But can we assert that such dependence is universal and complete?

Everyday life would seem to indicate decidedly, No. There appear to be numerous cases where the intensity is great, although the determinateness is small. Such are afforded by the apprehension of new notions; or even of old ones, if sufficiently difficult. Fatigue, also, can reveal striking contrasts in this respect; overnight, certain items may be apprehended with great, even obsessing, intensity, and nevertheless obstinately remain very indeterminate; on the following morning, these same items may arise in consciousness no more intensely than before, but now with determinateness of a line-engraving. Similarly, when a rather subtle argument is examined over and over again until understood with facility, the later rehearsals of it may quite well fall short of the earlier ones in intensity although surpassing them in determinateness. Or take the case where a man is deliberating; his apprehension of the chief relevant facts is apt to sink to a very low intensity as compared with various mere details, and yet to remain highly determinate.

The more trustworthy evidence of experiment, and in

¹ Incidentally we may notice how erroneous is the common view which confounds the real "lived" experiences with extremely obscure presentations. For such obscurity would involve a maximum of indeterminateness, and therefore be the very opposite to anything real. In truth, bare lived experience lacks the whole character of clearness-obscurity.

particular of the investigation already quoted in this chapter, leads to the same conclusion. Thus, although an exposure of .3" is far less effective than one of 1" for the purpose of investing the vision with its maximum of determinateness, it does not appear to be at all so for obtaining the other maximum, that of intensity as a cognitive experience.¹ And after sufficient practice in thus comparing the result of the shorter exposure with that of the longer one, it becomes possible to compare together the earlier and the final stages within the result of the longer exposure by itself. Once more, the cognition appears to need a shorter time for reaching its maximum in respect of intensity than in that of determinateness. There would thus appear to be *three* different characters rising to their maximum points separately, viz., intensity of sentience, intensity of cognition, and determinateness of cognition.

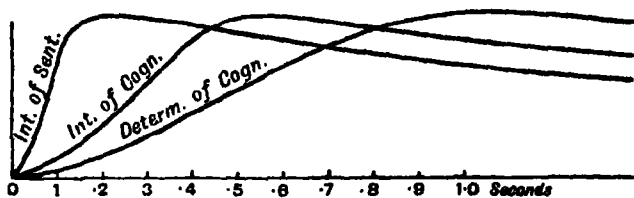


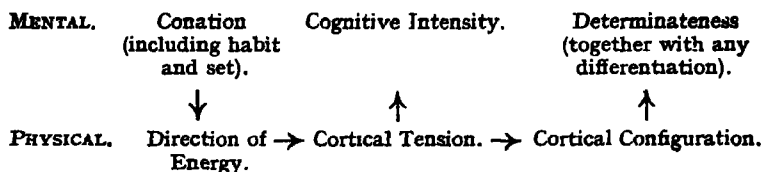
FIG. 15.

Naturally, this fact of the intensity preceding the determinateness is not confined to the sphere of visual perception ; so far as the present writer has been able to observe, it attends the rise of all other sorts of cognition in similar manner. The suggestion may be ventured, then, that there exists between the two a causal relation, the intensity serving directly to produce the determinateness. A person's conations can directly, it would seem, control his cognitions in respect only of intensity ; but this in its turn works upon their determinateness. I fixate the centre of an s in front of me and make an effort to intensify the upper half ; here-

¹ Needless to say, all due precautions were taken in these experiments to eliminate the influence of such merely peripheral factors as visual accommodation, etc.

upon, the latter becomes cognized in the first place more intensely, and in the second more determinately. From the psycho-physiological standpoint, one might suppose that the cognitive intensity is the mental counterpart of some cerebral tension that forces the cortical processes into some particular configuration; whereas the cognitive determinateness is the mental counterpart of this ensuing configuration itself. The lag of time in the change of configuration would be due to the latter's inertia. But if this be so, then one would expect that the same inertia would again be manifested on the tension ceasing; cognitive determinateness should accordingly not only rise later, but also persist longer, than the cognitive intensity. And this does appear to be actually what happens.

All these lines of causal connection may, in the case of voluntary cognition, be symbolized as follows (adopting, for convenience, the hypothesis of psychophysical interaction):



Herewith, it may be added, we appear to have touched the basal truths underlying the whole problem and controversy about the nature of "attention."¹

¹ The above analysis of "clearness" diverges from the not uncommon view that would identify it with evidence. In many cases, indeed, the two accompany each other in actual fact. But often they do not even do this much. Take, for instance, what has been called the basal proposition of algebra: "Every rational integral equation with real or complex coefficients has at least one root." This sentence can be apprehended with a high degree of both intensity and determinateness by a person who has no evidence or even conviction of its truth. Nor, on eventually attaining to such evidence and conviction, does either the intensity or the determinateness of the proposition itself seem to be necessarily enhanced. Or again, when several independent evidences tend to establish one single proposition, they combine into a collective evidence stronger than any constituent taken separately. But no such combination occurs as regards the intensity or determinateness of the corroborative evidences respectively; these by no means add themselves into one single greater intensity or determinateness.

DIFFERENTIATION

These two constituents, degree of intensity and that of determinateness having been disentangled, each can now be examined distinctly and will be found to originate quite a different train of psychic phenomena.

Possible, but not inevitable. From the imperfection of determinateness—to take this first—there derives the cardinal fact, so greatly and to some extent rightly emphasized in all evolutionary theories, namely, that cognition on developing can become more and more differentiated. For, obviously, any degree of indeterminateness leaves room for a strictly corresponding amount of divergence; if *A* is undetermined as to whether it is *X* or *Y*, then on further determination it can become *either X or Y*.

A simple experimental demonstration may be obtained by exhibiting for a fraction of a second two lines whose lengths under ordinary conditions are only just distinguishable. These respective lengths as apprehended so briefly will in appearance be equal; but then, on extending the duration of the exposure, they will become more determinate each in itself, and also will acquire difference the one from the other. Despite such changes in both these respects, be it observed, there may be no appreciable changes in respect of cognitive intensity.

That such a differentiation should result from determination, however, is only possible, not inevitable. For on replacing in the experiment the unequal by equal lines, these as apprehended momentarily will of course again present no apparent difference from each other; but this time, even the longer exposure, together with the ensuing greater determinateness, will fail to engender any difference of appearance.

Regressiveness. Experimental demonstrations can as easily be given of the reverse case, where determinateness, and therefore also difference, diminishes. If any two items are memorized, lapse of time renders the respective remembrances of them, not only more and more indeterminate, but

also increasingly inclined to be confused with each other. And the greater confusion evidently implies greater likeness. Such retrogressive change towards diminished difference has been thoroughly demonstrated by G. E. Müller, and formulated by him as the "principle of convergence."¹ This time, the change is not merely possible, like the reverse one towards divergence; it is inevitable.

There only remains to add that all such differentiation of the cognitive field by increasing determinateness of items *already existing* in it is by no means identical with the differentiation caused by the genesis of *new* items in virtue of our noegenetic principles. The danger of confounding these two really disparate kinds of differentiation becomes especially great when the noegenetic kind happens to be of the particular type which we have described as "diffusive" (p. 137). And the converse error is no less to be avoided; the change towards greater resemblance which results from objects becoming more indeterminate must not be confounded with that which derives from any items previously distinctive between the objects afterwards dropping out of them.

THE UNINTROSPECTIBLE

Of the two constituents into which "clearness" has thus been split, intensity and determinateness, we have so far been specially considering the latter only. Let us now turn to some very important matters intimately connected with the former. These will lead to the delicate topic of "sub-consciousness." But in order to handle this with any prospect of success, an indispensable preliminary is to settle what the word, and even "conscious" itself, are really intended to mean.

Meaning of "Conscious." As regards "conscious," this has been used in at least two significations that profoundly differ from one another. Originally, it meant, in accordance

¹ *Zur Analyse der Gedächtnistätigkeit und des Vorstellungsverlaufes*, iii. 1913, p. 510.

with its etymological structure, the mind's immediate cognition of its own experiences.¹ But later on it has come more and more to mean these experiences themselves. In this second sense, Ladd could quite correctly write :

" Whatever we are when we are awake, as contrasted with what we are when we sleep, that it is to be conscious. What we are less and less, as we sink gradually down into dreamless sleep, or as we swoon slowly away ; and what we are more and more, as the noise of the crowd outside tardily arouses us from our after-dinner nap, or as we come out of the midnight of the typhoid fever crisis." ²

This second meaning appears to have become ineradicable (and is frankly adopted in the present work). But alongside of and confused with it has also persisted, as usual, the original meaning. In such a manner, the distinction between the knowing of experience and that experience itself—won for psychology by Plato, Aristotle, Strato, Galen, and Plotinus—has been recklessly thrown away again.

A priori Grounds for Limen. Re-acknowledging, then, this precious distinction, there arises the problem—so frequent in other matters also—as to whether the two things thus admitted to be different in their respective natures are separable also in reality. Can an experience actually occur—as held by Plato, Plotinus, Leibniz, and perhaps the larger half of the moderns—without an awareness of it likewise occurring ? ³ In other words, have we been right in formulating our first or experiential principle as expressing only a tendency, not a necessity ?

Now, in favour of this view, at least one vital point will be conceded immediately, by all at any rate who have been trained in experimental introspection (and still more so by those who have had the task of teaching it to others). This

¹ See Occam, *Sent.* i. prol. Q. 1. Also Locke, *Ess.* ii. ch. i. § 19.

² *Psychology, Descrip. and Explan.* 30.

³ See p. 60.

point is, that to introspect one's experience may under some conditions become exceedingly difficult.

The conditions thus impeding the manifestations of the experiential principle are for the most part just the same as in the case of the eductive principles. Among such are inattention, fatigue, want of practice, inferior native ability, and fugitiveness of the data.

To a certain extent, however, the conditions vary in the two cases. The manifestations of the experiential principle are not in the least obstructed by indeterminateness; one can be quite sharply aware of thinking unsharply. But the other or eductive principles unquestionably suffer hindrance from this condition; the less any fundamentals are determinate, the worse will their relations be educed, and similarly as regards educating correlates. An unlikeness inverse to all this holds between the experiential and the eductive principle with respect to the intensity; for when this latter becomes very low, the power of experiential introspection rapidly declines, but yet *that of eduction seems to remain little affected*. In this way, it comes about that a cognitive item of low intensity can be very "clear" in the sense of intrinsically determinate and eductively effective, and nevertheless at the same time very "unclear" in the sense of unamenable to introspective apprehension.

On the whole, then, the apprehending of experience does, like the educating of relations and correlates, sometimes have to contend with very great difficulties (although these are not always the same in the two cases). And this is almost tantamount to saying that in the experiential no less than in the eductive cases, there exists a possibility of the principle *not* arriving at realization. Reasonably, we may expect that experience will escape introspection altogether so soon as the conditions become sufficiently unfavourable, and especially when these experiences have very small intensity or duration.

Herewith, we obtain what seems to be the only definite and serviceable meaning of "*subconscious*," namely, as the

character of those experiences which, owing to their low intensity or brief duration, lie beneath the limit or "limen" of introspective awareness.¹

Crucial Cases. Is, then, the preceding expectation of the existence of such a subconsciousness corroborated by the actual facts? Let us pick out any crucial cases, where an experience may confidently be inferred to occur in only minimal intensity; and let us see whether here introspection does actually, as expected, become impossible.

Perhaps the simplest of such crucial cases is afforded by what is commonly known as a "set" (including the conatively reinforced kind called a "determining tendency"). Here, a person resolves to do some act involving a more or less lengthy preliminary period; e.g., the act may be merely to press a button as soon as a pre-arranged signal is given. In general, the resolve shows itself to diminish in experiential intensity with lapse of time. But it must be taken not to die out altogether until the set becomes no longer effective, so that the person "forgets" to react according to it. During the later portion of the period of set, therefore, the intensity of experience must reach its lowest degrees. Now, during all this later portion—experimental investigations are unanimous on this point—the resolve does actually become *wholly insusceptible of introspection*. Just the same result has always been obtained when the set is not directed towards any mere movement, but some obviously noetic kind of process. This latter may, for example, consist in the eduction of a correlate; an experimental observer instructed to say the opposite to each of a long series of words will in time give his responses without any introspectible awareness of being guided by his previous instructions. Such a disappearance of the instructions from manifest

¹ By this definition, it may be remarked, the subconscious denotes just that which is "conscious" in the modern meaning of this latter word, but not so in the ancient meaning. The subconscious in this sense would probably include (as a special variety) much that pathologists commonly call *unconscious*. See, for instance, the admirable *Instinct and the Unconscious*, by Rivers, pp. 14-16.

consciousness has been reported very often, notably by H. Watt¹ and May.² Are there any contrary cases, that is, where minimal intensity can be confidently inferred and yet introspection does remain possible? None such are known, at any rate to the present writer.

These and numerous similar facts support the statement already made, that the intensity of a cognition lapses much sooner than its determinateness (p. 160). The quick decrease of intensity is proved by the disappearance from introspection; the slow decrease of determinateness, by the eventual correctness of the reaction after all.

Another typical case of such introspective disappearance is supplied by tests of discrimination. And in these our present considerations incidentally explain a paradox which has sometimes aroused great interest and led to rather wild conjectures. This consists in that the second of two sensory qualities presented successively for comparison may be confidently judged to be different from the first, although this latter seems at the time to have entirely vanished from consciousness. In the light of the standpoint gained by us, the apprehension of the quality presented first must be taken to have sunk to such a faint intensity as to be no longer introspectible, whilst still remaining sufficiently determinate to enable the comparison to be made.

A further abundant supply of examples is furnished by sensory perception. Nothing simpler can well be found than the instance which comes to expression in the figure on p. 161. Here, both the intensities (sentient and cognitive) as well as the determinateness are shown to pass through every degree from zero up to the maximum. Yet when a bright light is exhibited to any one, or a loud noise is sounded, or a forcible pressure is suddenly applied, he will in vain exert all his introspective power to catch either of the intensities or even the determinateness at any degree approximating to zero. Still more ineffective, if possible, would be the attempt to become aware of any percepts deriving from the

¹ *Arch. f. d. g. Psychologie*, iv. 1904.

² *Archives of Psychology*, 1917.

eyes separately before the perception from them jointly ; and yet the occurrence of some sort of uniocular vision previous to the binocular seems to have been strongly evidenced.¹ Most surprising of all, perhaps, is the complex system of experiences that may be inferred to antecede even ordinary tactual localization, although to become aware of them by introspection would appear to be a hopeless enterprise.²

Attributes of Transition. Since thus introspection may be impotent to detect whole concrete experiences, there is the less reason for astonishment that it should often fail to notice those much more elusive attributes which appertain to transition from one concrete experience to another. The most elementary instance is bare successiveness. Thus, it is reported that on experimental exhibition of a picture of any familiar thing, the perception seemed introspectively to include such characters as symmetry, thinghood, and even values, "from its very beginning."³ But these characters must really have been posterior eductions from many more elementary cognitions. The building of one cognitive level upon another was done too swiftly for their successiveness to be apprehensible.

A more complex instance is the awareness as to what constitute the initial items out of which an eduction issues. That such awareness may be very confused has been noted already (p. 76). Here may be added that it can altogether fail to occur. Familiar examples are the apparent distances of sights and sounds ; these are, in general, derived from initial clues that completely escape being known to be such. So, too, the perception of colours ; *c.g.*, the paper just in front of me looks quite white, whereas the slate roof outside

¹ See the work of Sherrington on "Flicker," *Brit. J. Psych.* i. 1904. Also the analysis of stereoscopic vision by the present writer, *Ophthalmological Soc. Trans.* xxxix. 1919.

² A demonstration of this (also by the present writer) is furnished in "Die Normaltäuschungen in der Lagewahrnehmung," Wundt's *Psych. Stud.* i. 1906.

³ Bartlett, *Brit. J. Psych.* viii. 1916.

seems to be only a dull grey, although in reality the roof is far the brighter object of the two. My perception of it takes into account its relation to its environment. But of such a relativity characterizing the perceptual process (which latter is thereby shown to be the eduction of a correlate) there is no concomitant awareness. Another and particularly curious instance of this kind is afforded by the comparatively large "blind-spot" in the retina. This the mind always proceeds to fill out appropriately to its surrounding field, but without the least suspicion of so doing.

Upon occasion, strangely enough, even the final member of a noetic process can fail to manifest itself introspectively. Thus, in some experiments where two related words were exhibited, the person reacted quite in accordance with this relation but nevertheless introspected as follows :

"I did not perceive any relationship at all between the task words. I just stared at them for a moment and was set. All I experienced was a definite feeling of readiness."¹

Of less practical but more theoretical importance are the questions that here arise about those characters of the eductive processes which we have called "belief" and "insight" (p. 50). Not unnaturally, one might suppose that these must necessarily vanish as soon as any of the terms do so in the proposition to which they belong. But in certain cases, at any rate, this proves to be not necessary. On hearing two sounds in sequence and becoming aware that the second is the louder, there is a possibility—paradoxical as it might seem—that although one is looking in vain for any consciousness of the first sound, yet nevertheless one finds an apparently genuine insight that the second sound is louder than it. And after once detecting such insight, this often furnishes a trail whereby the hitherto missing presentation of the first sound can also be rendered manifest. A similar operation has been prettily demonstrated in

¹ May, *Archives of Psychology*, 1917.

some experiments of Bühler, where the percipient has first an apparently insightful awareness that one spatial magnitude is "greater" than another, but only later and with difficulty picks out what other item he is perceiving it to be greater *than*.¹

There remains to be considered, however, the far more usual case, where the insight as also the belief do disappear beyond all power of observation. Shall we say that when this fate befalls them they cannot possibly continue to exist at all? To take up this position would be to assert that these cognitive characters, belief and insight, alone of all constituents of experience, escape the need of having to surmount a limen of intensity before becoming able to generate an awareness of their own happening. Such a position would seem to be at least dubious. One is inclined, rather, to regard as still open the possibility that, just as there may be subconscious fundamentals and relations, so also there can exist subconscious belief and even insight.

Rival Theories. To explain such facts, and indeed all considered in this chapter, there are, however, some rival theories in the field. One is that the experiences which we have been regarding as not coming to awareness, do so really, but are thereupon incontinently forgotten. This theory has no great following. Besides resting upon the very disputable ground that all introspection consists at bottom in retrospection, it succumbs to the objection that the ascertained laws of memory are quite opposed to such instantaneousness of forgetting.

The second and more important theory is that the un-introspectible processes are not in truth mental at all, but wholly physiological. But against this, too, there are numerous objections. To begin with, the processes at issue are precisely of the sort that, according to all other psychological evidence, do necessitate the intervention of mind. Then again, there are many facts to which such a theory is obviously inapplicable; an instance is the already men-

¹ *Die Gestaltwahrnehmungen*, 1913, p. 242.

tioned impossibility of introspecting the lowest grades of intensity and determinateness during the rise from zero to maximum (p. 161). Such grades certainly *are* characters of mental experiences, so that a subconsciousness must be invoked for these cases anyhow, and to invoke additionally the *unconscious* activity becomes quite superfluous.

The theory here preferred, that of a subconsciousness, admits, moreover, of being carried into illuminative detail. For example, the long persistence of cognition in faint intensity is at once explicable by the quantitative principle of fatigue. For any mental process can last the longer, the lower its intensity (irrespective of its degree of determinateness). At a sufficiently low intensity, it probably need not necessarily cease at all; an equilibrium may be reached; physiologically speaking, the dissimilation is now fully compensated by the simultaneous assimilation. No less easily, too, is the fact explained of the subliminal area being large. For since the expenditure of mental energy is the product of quantity multiplied by intensity, the former of these factors may be as great as desired, so long as the latter is correspondingly small.

Extent of Subconsciousness. How large is, then, really this subliminal area, this stratum of experience lying below the limen of introspection, although still able to activate education?

Some evidence on this point can be obtained by examining the general configuration of the upper stratum where observation is still feasible. Here, the greatest intensity of cognitive experience is restricted to an extremely small field; also we may notice that, as the intensity diminishes, the field not only broadens, but does so in continually increasing proportion. And in so doing, it only follows a tendency of very wide-spread occurrence, whose exemplar is the "normal" or Gaussian distribution curve. Reasonably, then, we may surmise that this tendency of the upper stratum—perfectly regular in itself, and also conforming to such wide occurrence elsewhere—continues in the lower stratum also. If so, the

whole configuration must more or less resemble the following figure.

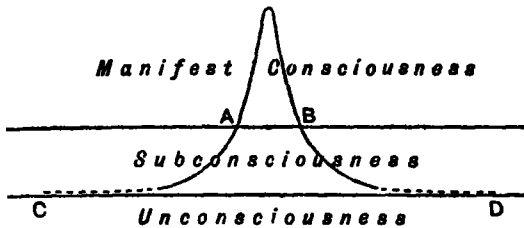


FIG. 16.

Now, even the extent between *A* and *B* would appear, on careful examination, to be astoundingly large ; in this respect, we must cordially agree with the description of Read.¹ How vast, then, must be the extent between *C* and *D*.

More satisfactory evidence than of this purely formal kind can be had by summing up all the subconscious items that are indispensable in order to explain those which are conscious manifestly. And here we might appeal to the preceding chapters (especially X.) ; the need of a subconsciousness to explain the manifest consciousness shows itself to be ubiquitous. But the most compendious demonstration can perhaps be taken from the sphere of memory. Let any one ask himself whether he has been out for a walk during the day. He will probably be able to answer with confidence *instantly*. His mode of operation will not in general resemble any sort of waiting till the manifest ideas should reproduce their former associates ; this is particularly obvious when the response happens to be *negative*. It appears far more like a response derived from information somehow or other already available. Let him next ask himself similarly, whether he has ever been out of his native land in his whole life. He will be able to answer just as quickly and confidently ; and in just the same looking, rather than waiting, manner as before. There would appear, then, to be no small ground for agreeing with the ancient view, that a man's subconsciousness actually contains a comprehensive record

¹ *Metaphysics of Nature*, 2nd edit. 1908, ch. x. p. 199.

(however faint and indeterminate) of his whole previous life-history. Even all this, of course, is far short of the record that can at the limit be evoked by way of reproduction ; for this probably extends to the person's previous life-history in full detail.

The final remark may be appended that, throughout the preceding consideration of subconsciousness, no reference has been made to the more dramatic phenomena observed or claimed to have been so. No allusion has been made to the sometimes advocated non-intelligent or super-intelligent "instincts," the "subliminal powers of genius," and so forth. Even of the immense Freudian literature, no usage has been made here. Before attempting to explain such abnormal, and in large degree still very controversial, matters, it would seem advisable first to investigate carefully the nature of the allied and perfectly normal facts.

CHAPTER XII

THOUGHT AND SENTIENCE

SUBSTITUTION OF SENTIENCE FOR THOUGHT.

'Structure' and 'Function.' Analysis. Symbolism. Absurdity of View.

INDISPENSABILITY OF SENTIENCE FOR THOUGHT.

Images. Words. Miscellaneous Items.

USEFULNESS OF SENTIENCE FOR THOUGHT.

Effectiveness in general. Evidence of Introspection. Evidence of Correlations. Evidence of Deprivation.

CONCLUSION.

SUBSTITUTION OF SENTIENCE FOR THOUGHT

THE preceding topic of subconsciousness irresistibly leads us on to and impels us to take some part in the extremely acute, even embittered, controversy as to the connection of thinking with mental "images."

"**Structure**" and "**Function.**" The extremist doctrine on the matter goes so far as to maintain that thought, in the sense of presenting to mind cognitively anything that is not at the time present in it as a real event, must be absolutely impossible; all seeming cases of this occurring are said to be reducible without any remainder to some actually present sensation, emotion, and so forth. Such a doctrine has, perhaps, not often been explicitly formulated. But it seems to have frequently been implied. Particularly concerned here is the large and important school of psychologists who lay great stress upon the distinction between the "structure" and the "function" of mental processes. With regard to what is meant by "structure," this would appear to be nearly equivalent to what we have been calling "experience"

(either as only lived, or else as also cognized). But with regard to the "function," this word has been left regrettably equivocal. Possibly, some of the writers signify by it nothing more than *service in general*, and are only maintaining that to think of any items not given in present experience requires the service of others that are. In this signification, there would not be any conflict with the views that have so far been developed by ourselves. But some of their writers convey the impression, rather, that the "functioning" must be taken in the sense of certain items of the actually present experience always acting as *substitutes* for any genuine thoughts of absent things, much as the algebraic x and y act in cognition substitutively for quantities not at the time cognized at all.

Analysis. A similar equivocality infects the frequent assertion that imageless thoughts, or the so-called "conscious attitudes," have to a large extent been already "analyzed" into present experiences, sensory and affective, and that the rest have every prospect of being so analyzed eventually. Possibly, this assertion is only intended to signify that such thoughts can be analyzed down to these experiences in respect of real existence, although not so analyzable in respect of "conscious meaning." If so, this again might not seriously conflict with our own position as developed up to the present point, namely, that the existence of the mental objects of thought is not real, but of the nature called "in-existence" (p. 71); the divergence of view might evaporate into little more than a matter of choosing between the expressions "in-existence" and "conscious meaning." Very different, however, becomes the said assertion, if taken to signify that imageless thought can be analyzed into actually present sensation or emotion without leaving any remainder of awareness at all. For analysis in this exhaustive sense leads once more to the above-mentioned extremist theory of substitution.

Symbolism. The same equivocality extends, furthermore to the expression "symbol," as illustrated in the following

passage, where the process of understanding "infinity" is traced back to kinaesthesia.

"The kinaesthetic symbol for *infinity* is found in the tendency to prolong the word, this prolongation being accompanied by the distinct impression of projecting it from the mouth, and then following this projected word by definite bodily movements." ¹

This might possibly be taken to concede that there occurs, over and above the symbol itself, some sort or other of awareness of what is being symbolized, as happens when a Christian uses the cross to symbolize his religious faith. But instead, it might signify that there occurs at the moment no awareness whatsoever of that which is being symbolized, just as was said by Freud to be the case when a fireplace symbolized an organ of sex. With this second signification, the theory of substitution arrives again.

Absurdity of View. Now, let us consider this extremist substitution theory. On its behalf there can, indeed, be advanced the *a priori* argument of all action being "by contact." The plea can be urged—and would seem to be at any rate implicit in many of the arguments commonly employed—that nothing can possibly get outside of itself and extend to places and times in which it does not exist. And then the inference can be drawn, that the supposition of any mental processes being able to grasp anything not actually present must necessarily be irrational.

But against this view the cogent reply can be made that it straightly involves solipsism, and in its most absurd form. It asserts, in fact, that no person can ever possibly think of anything, whether true or even fictitious, except his own momentary mental states; he cannot so much as suspect that even he himself has undergone any mental state before, or may do so ever in the future. Surely it is a little incongruous for the holders of such views to write books on psychology, with the hope, to boot, of instructing other people!

¹ Titchener, *Textbook of Psychology*, 1911, p. 517.

(either as only lived, or else as also cognized). But with regard to the "function," this word has been left regrettably equivocal. Possibly, some of the writers signify by it nothing more than *service in general*, and are only maintaining that to think of any items not given in present experience requires the service of others that are. In this signification, there would not be any conflict with the views that have so far been developed by ourselves. But some of their writers convey the impression, rather, that the "functioning" must be taken in the sense of certain items of the actually present experience always acting as *substitutes* for any genuine thoughts of absent things, much as the algebraic x and y act in cognition substitutively for quantities not at the time cognized at all.

Analysis. A similar equivocality infects the frequent assertion that imageless thoughts, or the so-called "conscious attitudes," have to a large extent been already "analyzed" into present experiences, sensory and affective, and that the rest have every prospect of being so analyzed eventually. Possibly, this assertion is only intended to signify that such thoughts can be analyzed down to these experiences in respect of real existence, although not so analyzable in respect of "conscious meaning." If so, this again might not seriously conflict with our own position as developed up to the present point, namely, that the existence of the mental objects of thought is not real, but of the nature called "in-existence" (p. 71); the divergence of view might evaporate into little more than a matter of choosing between the expressions "in-existence" and "conscious meaning." Very different, however, becomes the said assertion, if taken to signify that imageless thought can be analyzed into actually present sensation or emotion without leaving any remainder of awareness at all. For analysis in this exhaustive sense leads once more to the above-mentioned extremist theory of substitution.

Symbolism. The same equivocality extends, furthermore, to the expression "symbol," as illustrated in the following

passage, where the process of understanding "infinity" is traced back to kinaesthesia.

"The kinaesthetic symbol for *infinity* is found in the tendency to prolong the word, this prolongation being accompanied by the distinct impression of projecting it from the mouth, and then following this projected word by definite bodily movements." ¹

This might possibly be taken to concede that there occurs, over and above the symbol itself, some sort or other of awareness of what is being symbolized, as happens when a Christian uses the cross to symbolize his religious faith. But instead, it might signify that there occurs at the moment no awareness whatsoever of that which is being symbolized, just as was said by Freud to be the case when a fireplace symbolized an organ of sex. With this second signification, the theory of substitution arrives again.

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¹ Titchener, *Textbook of Psychology*, 1911, p. 517.

From the experimental standpoint there arises the further objection to the substitutive theory that it appears to be everywhere contradicted by the introspections even of those who seem most desirous of adopting it. For instance, when an experimental subject reports that he has had a thought of the past, he may well indeed supplement this by saying that "the pastness is more visual than anything else; it seems far away and foreshortened."¹ But this supplement, far from cancelling the original report, only re-implies it. For a visual image that *merely* seemed "far away and foreshortened" would never be reported by any one as conveying an idea of the past. To seem far away is one event; to convey the meaning of past is another.

As a blow of grace to this strange theory of substitution—and perhaps as a relief to those who have hitherto seen no escape from the *a priori* argument that nothing can get outside itself—has come the establishment of our third noegenetic principle. For by virtue of this, the ability to present to mind items other than actually occurring experiences proves to be a most natural occurrence; it seems to be probably among the earliest and most primitive of all cognitive achievements (p. 107).

INDISPENSABILITY OF SENTIENCE FOR THOUGHT

On a very different footing, however, stands the more moderate version of this doctrine of "structure and function." This concedes that the mind does somehow or other arrive at thinking of absent things; it only maintains that such a feat cannot possibly be effected apart from certain actually present states of sentience or affection. This moderate version has, as a matter of fact, been adopted by the majority of psychologists in all ages. Unlike the substitution theory, it must at least be considered with great respect.

Images. The first point to settle is the precise nature of structure thus declared to function in thinking. According to the most ancient and widely held view, it consists of the

¹Clark, "Conscious Attitudes," *Am. Journ. Psych.* xxii, 1911, p. 220.

secondary sentience commonly called "imagery." When a traveller in a tropical desert manages to think how pleasant would be a cool bath, he does not do so by any bare "act"—it is said—but by his images; he is able to mean the sensations of coolness because he actually experiences their more or less ghostly copies. Even when his mind departs from the domain of sensation and ascends to the regions of abstract thought, it still continues to be borne along, according to this view, by such sensory spectres. As Aristotle declared, so too most subsequent writers have more or less articulately agreed, that there is "No thought without image."

On turning to the evidence for this iconic doctrine, it too shows itself to be largely of an *a priori* character. And to one of the arguments that in some shape or other is frequently advanced, we must strongly demur. For it is only the old one of "action by contact" again. And this cannot properly be urged as giving any advantage to the imagery over the bare "acts"; that an image should get outside of itself is at least as wonderful as that an act should do so.

Akin, but distinguishable, is the argument that a thought, if not based on any real experience such as imagery, etc., must be a nonentity altogether, a cat's grin without the cat. Some such opinion would seem to influence many even of those authors whose general views are quite antithetical to sensism, since upon occasion they write passages of the following tenour:

"An idea can no more exist without an image than perception can exist without sensation."¹

Still, such a dogmatic proposition can hardly be straightway accepted as self-evident; it stands at least in need of further substantiation.

Much more plausible is the *a priori* argument of Aquinas, who seems to have invoked the agency of images in order to explain how thought can be influenced by the state of the brain. Thought itself—so he and many others have main-

¹ Stout, *Manual of Psychology*. 1913, p. 529.

tained—is outside the sphere of action of the merely material processes occurring in the body; but these material processes do have power to govern the sensory images; and the latter in their turn are able to influence the thought. In this manner, an explanation has been furnished for the subjection of the spiritual soul to disturbances of obviously bodily origin, such as drunkenness or insanity. But against this must be set the fact that those modern thinkers who agree with Aquinas about thought having no immediate substrate in the brain, nevertheless by no means always conclude that the images are indispensable.¹

Most modern authors have adopted quite other general theories of cognition, and yet they too declare the need of believing that thought should be inseparable from some such sentient basis as imagery. Thus, Angell writes with his customary frankness:

"To suppose that one can occur without the other is utterly to destroy the entire foundation on which rests the theory advocated by most of us concerning cognitive operations."²

But about this plea there is a discomfiting likeness to the well-known argument of the philosopher, that if the facts would not fit his theory—so much the worse for the facts!

Let us, then, turn to the evidence *a posteriori*, that is, to the reported observations of the facts themselves. At first sight, these seem to be completely corroborative. Innumerable psychologists, ancient and modern, have confidently stated that under all circumstances they actually discover their thoughts of absent things to be accompanied by, and intimately dependent on, the aforesaid mental phantasms.

The weak point here, however, lies in the further observation that such imagery varies extraordinarily for different individuals. Irrefutable as has been the proof that it

¹ W. M'Dougall, *Body and Mind*, 1911, ch. xxii.

² *Psych. Rev.* xviii. p. 316.

permeates the thinking processes of many persons, no less solid would appear to be the evidence that many other persons, at least equally capable of thinking, are almost destitute of it.

Verbal Sentience. To meet the last objection, this doctrine that the presentation of absent things is necessarily a function of their present images, has had from an early age to receive a supplementary clause; in such functioning, it is now added, the images of the things are capable of being replaced by the images (or actual re-sensations) of the words which denote the things.

In support of this supplement, it is said that those individuals whose thinking is especially deficient in the images of the things tend to have a correspondingly abundant "inner speech" concerning them. And this assertion would appear to be, in general at any rate, quite correct. A classical account of such inner speech has been given by Egger.¹

Once more, however, the general rule is broken by very numerous exceptions. The most exact investigation of the matter hitherto would appear to be that which was conducted by H. Reed.² He carefully devised tasks where visual imagery could not be effective; he supposed that then the function of thinking would inevitably devolve on the inner speech. His eventual report, however, is,

"I was disappointed to find that most of my subjects gave not the least confirmation for my hypothesis."

Here, the individual case of the present writer, being somewhat extreme, may perhaps have enough interest to be worth description. With him, the operation of thinking not only reveals very few and poor images of the things themselves, but often appears to be equally devoid of verbal presentations. This may, perhaps, be attributed in some measure to prolonged residence in foreign countries, whereby most concepts have become almost as likely to evoke a foreign

¹ *La Parole intérieure*, 1881.

² *Journ. Exper. Psych.* i, 1916.

as a native word. The result seems to be a mutual interference; frequently the rise of an idea is followed by a pause for the purpose of deciding into which language to render it. A corroborative case is that of a no less competent observer than Mr. Flügel, who speaks several languages almost as well as English, and has kindly communicated the following similar, although for *him* exceptional, manner of thinking. One evening, after a day of unusual fatigue, he observed to his surprise that the whole course of his thought, although not richer in images than usual, had become quite wordless; only by an express effort could he translate it into any language.¹

Such a general course of cognition as that of the present writer, surging on like a deep, dark, formless sea, and almost unconcerned with the meagre sentience incoherently twittering on a higher level of cognitive intensity, may be contrasted with the mind that can describe itself as follows:

"It is a fairly complete picture gallery,—not of finished paintings, but of impressionist notes. Whenever I read or hear that somebody has done something modestly, or gravely, or proudly, or humbly, or courteously, I see a visual hint.... The stately heroine gives a flash of a tall figure, the only clear part of which is a hand holding up a steely grey skirt.... I never sit down to read a book, or to write a paragraph, or to think out a problem, without a musical accompaniment.... There are occasions when my voice rings out clearly to the mental ear and my throat feels stiff as if with much talking."²

Intermediate between two such extreme individuals, the lack of imagery, even verbal, would appear to befall most people in at any rate minor degree. The introspective

¹ On reading the above, Mr. Flügel writes to me further: "My ability to speak several different languages in immediate succession had been severely strained during the day (an international congress), so that the explanation you give of your own case would be very applicable here also."

² Titchener, *Experimental Study of the Thought Processes*, 1909, pp. 9-10.

records of Ach, Messer, Bühler, Selz, Koffka, Michotte, Bovet, Woodworth, Aveling, Martin, and many others—originally inspired by the genius of Külpe—exhibit long stretches of thought without any detectible images, either of the things themselves or of any words denoting them. And the researches of T. V. Moore, still being unremittingly pursued, are painting the descriptive character of pure thought with photographic detail.¹

Nevertheless, such evidence cannot be accepted as conclusive. For although no images were detectible, they might still be occurring subconsciously, through being "incipient," "faded," and so forth.

Cogent enough, on the other hand, would appear to be the further fact that when images, whether of things or of words, do manifest themselves, they are often noticed to be *discrepant* from the thought. This appears to be no longer denied by any one. But it at once deprives both the images and the verbal sentience of the very properties which had made them seem capable of playing the part assigned to them in thinking. For the imagery had been supposed to "mean" objects by virtue of copying them; and the verbal sentience, by virtue of having fixed associations with them. But in such cases of discrepancy, both these virtues break down, without the thought hereby suffering any disturbance.²

Miscellaneous Items. With this break-down the theory of structure and function enters upon a new, very remarkable, and exclusively modern phase. The difficult situation is boldly faced. The constituents of the "structure" are

¹ *Psych. Rev.* xxii. 1915; *Ibidem*, xxiv. 1917; *Psych. Mon.* xxvii. 1919.

² An interesting mental conflict appears to have been undergone by Binet. On the one hand, his immediate observation has shown that thought could exist without either images or verbal representations; but, on the other hand, his general psychological theory had taught him the impossibility of such a thing. Pressed by the dilemma, he arrives at the strange conclusion that the very item which he had discovered solely by introspection is nevertheless "unconscious." He writes: "Mais quelque peine que nous ayons à nous représenter une pensée sans le secours des mots et des images—et c'est pour cette raison seulement que je le dis inconsciente—elle n'en existe pas moins." *L'étude expérimentale de l'intelligence*, 1903, p. 108.

acknowledged to possess no "inward significance."¹ Instead, their importance is said to depend only "on their appointed sequel, on what they bring after them in the mental train."¹

But by this admission, the sphere within which to seek for the structural items serving thought becomes unlimitedly enlarged; *any* kind of sensory or affective experience, whether visual, auditory, tactile, kinaesthetic, visceral, or otherwise, may function equally well. As is unmincingly conceded,

"They may be the merest chaff and trumpery of consciousness—the feelings of some momentary tension of the skin or twitch of a muscle."¹

Quite accordingly, when an experimental subject observes passing through his mind the thought, "I ought to know that," he claims that the structure of it is "organic sensation and disagreeable feeling."² When he notices himself to think of "justice," the claimed structure is "I started back and threw my head back."² For an awareness "that I should have pressed sooner," the structure is said to consist of "a twitch in the finger, organic sensation, and catching of breath."² The awareness that "the sides were not uniform but had different shapes" "consisted simply in fixating upon one corner."³ When "I became aware that my observation had occupied a good deal of time and that the exposure might terminate before I had noted all of the features," all this "consisted in a quick turn of my attention to these features."³

But such invocation of any sort or description of sentience or affection indifferently as equally well serving the purposes of thought must result, to say the least of it, in putting the general issue on a different footing with respect to evidence. For since sentience or affection of some kind or other occurs throughout the course of consciousness, the fact of it serving a thought can no longer be proved by simply noting that it

¹ D. Miller, "Function and Content," *Psych. Rev.* ii. 1891.

² H. Clark, "Conscious Attitudes," *Amer. J. Psych.* xxii. 1911.

³ S. Fisher, "Generalizing Abstraction," *Psych. Mon.* xxi. 1916.

coincides with the thought in time. Instead, the proof is now obliged to descend into much greater detail. The kind of service at issue, whether that of having an "appointed sequel" or otherwise, must be definitely specified; and then no less specific must be the proof that service of such particular kind is actually rendered.¹

USEFULNESS OF SENTIENCE IN THOUGHT

This new task, that of furnishing evidence as to how sentience or affection assists thought, may be approached along several different routes.

Effectiveness in General. We will commence by comparing the two in respect of general effectiveness. For in order that the sentience should take over any office of the thought with advantage, it must at least be able to perform such office in a more effective manner; that is to say, it must exercise a better effect on the course of cognition subsequently. In the language of the school we have been considering, the sentience itself would then belong to consciousness "structurally," whereas its subsequent effect would be a matter of "function."

Now, the basal sequences in the course of cognition are just those given in our noegenetic principles. And as regards the *first* of these, the comparison does result much in favour of the sentience; the images, the verbal representations, and even the miscellaneous accompaniments of thought are indubitably easier to introspect than the thoughts themselves. But such superiority altogether vanishes when we turn to the second and third principles. For in the course of ordinary thinking, the finding of relations and of correlates obviously have their initial data in the thought itself, not in any of its sentient, motor, or affective accompaniments.

¹ The non-experimental literature is too immense for quotation here. But special reference may be made to the numerous and valuable papers which have recently appeared in *Mind* and in the *Proceedings of the Aristotelian Society*, notably those of Alexander, Hoernlé, Stout, Carr, Edgell, 1913.

When I reason that the present prime minister will probably resign, I certainly do not mean that my image of him will hand in its portfolio. Nor, when I decide that a holiday would be beneficial for myself, do I thereby expect my fatigue to be dissipated by the sight, sound, or laryngeal movements of the letters, h, o, l, i, d, a, y. Turning to the more exact evidence of experiment, we have the report of Aveling that :

"Thought sequences obtain mainly between conceptual contents. These are the important and only necessary elements of thought." ¹

After the noegenetic principles come those which are merely quantitative. The one chiefly concerned here is that of retention as manifested in associative reproduction. We can compare the thoughts with their concomitant sentience in respect of power to reproduce previous associates. Again, the verdict must be altogether on the side of the thought. This latter, far from being a mere dependent, proves to be in general much the more effective of the two. If, for instance, we go through the long roll of experiments on "free association," from Galton to Koffka, everywhere we find the dominantly effective factor in the reproduction to be the thought component; second—and a very bad second—come the feelings; as for the images and movements, these appear to be in this respect comparatively impotent. Or if we take, instead, such investigations as that of Bühler, the result is still the same.

"That which was not connected by thought was unable to be reproduced." ²

Indeed, were it not for this dominance of the thought itself, it is hard to see how ideation could maintain logical coherence and not degenerate into inanity.

Instead of the present power of mental items to reproduce their former associates, let us look at their subsequent power to be revived themselves. Here again, the thought is not

¹ *The Consciousness of the Universal*, 1912, p. 147.

² *Arch. f. d. ges. Psych.* ix. 1908, p. 30.

shown to be any helpless dependant on its accompaniments, but, on the contrary, to be much more effective than they are. For example, a passage read from a book can, as a rule, be remembered in general meaning long after the concomitant particular words, images, movements, and feelings are quite beyond recall.¹

Evidence of Introspection. We may now take another route for the purpose of ascertaining the effectiveness of the sentient concomitants of thought. We can examine whether these, even if of little efficiency by themselves, may not still render indispensable service of an auxiliary kind. Our method of examination will commence by being purely introspective. And we will consider, in particular, the specially crucial and well investigated case of mental imagery. When any person is engaged in thinking, he can notice whether or not his images seem to be of assistance.

Some estimate of this sort has long been formed by popular verdict, and it appears to be very high. This is testified by language; for he who can most effectively transport his thoughts beyond the sphere of his previous experience is credited with having most "imagination."

The estimate reached by the more scientific procedure of psychological experiment is a lower one. For certain purposes, such as abstract thinking, the images are commonly reported to seem even disadvantageous. But still for other purposes, they are said—quite unanimously, it would appear—to be of very considerable utility. Above all, they are noticed to enhance cognitive *stability*. Thus, Aveling writes:

"Thought is perpetually in process of becoming, in which process it passes beyond itself. It is unstable. But the image is a relatively stable formation; and as long as it is present in consciousness, its conceptual element will also tend to remain."²

¹ See, for instance, the work of E. Henderson, already quoted on p. 82.

² See p. 179 of work quoted on page 186.

Martin writes similarly.

"As fixation point, the visual image unquestionably gives the memorative experience a more certain foundation, inasmuch as it is maintained with great constancy and is held more continuously in the focus of consciousness" ¹

The same opinion is reached by T. Moore² and many others.

Evidence of Correlation. All this evidence, however, un-animously as it results and skilfully as it has been obtained, is still not beyond the range of doubt. Bare introspection—as every experimental psychologist well knows—becomes very fallible so soon as it ventures to say, not only what a mental process *is*, but also what it *does*. In order to ascertain whether any mental factor really assists any performance, the sole reliable methods are the so-called "objective" ones. In these, the factor at issue is varied, and then note is taken as to what variation follows in the performance. And one cardinal way of varying the factor is by examining different individuals who manifest it in different degrees. We thus arrive at the method of correlations.

The first important applications of this method to the present problem appears to be due to Betts.³ His experimental subjects were set the following task :

"A three-inch cube, painted red, is sawed into inch cubes.

(a) How many of the inch cubes have paint on three faces ?

(b) How many on two faces ?

(c) How many have no paint on them ?

Now, describe the images, if any, which came before your mind in thinking out the answers."

His conclusion is :

"The fact that 35 per cent. of the cases made the solution without the use of imagery, and made as good

¹ *Zeitschr. f. Psych.* lxx. 1914-5, p. 50. ² *Psych. Rev.* xxii. 1917.

³ *The Distribution and Functions of Mental Imagery*, 1909.

a record in accuracy and speed as was made by those who reported the presence of imagery, makes one seriously question whether the accompanying imagery may not have been an incident rather than a necessary factor in the solution in many of the other cases as well."

This issue was so surprising, that another investigation on a larger scale was undertaken in our own laboratory by Dr. Carey :

" An endeavour was made to discover some test whose performance seemed to depend upon visual imagery. Such tests, it was thought, would give high correlations with visual imagery according to introspections. Two tests were selected. In the first, twenty drawings consisting of five or six straight lines joined in a variety of irregular ways were made upon separate cards. The cards were each exposed for about one second, and the children were required to draw on some paper before them as much as they could remember of the figure. This test was chosen, because according to the introspections of two psychologists, on whom it was tried beforehand, the clearness and duration of the primary memory image seemed to be important.

In the second test a number of pieces of paper were folded into halves, and in each piece a hole was cut in the middle of the folded edge. These were shown to the children for a short time, and then they were required to draw the hole as it would appear if the paper were unfolded." ¹

As result, the correlations of success in these two tests with the clearness and duration of imagery was found to be inappreciable. The respective numerical coefficients were .13 and .06 (prob. err. in both cases $\pm .07$).

Corroboratory low correlations have also been found by

¹ Dr. Carey, " Factors in the Mental Processes of School Children," *Brij. Jour. Psych.* vii. 1915, p. 465.

Washburn, Adler and Williams (although such a result would seem to be in marked opposition to their previous views). Very low, too, was the correlation reported by Thorndike.¹ And still more recently, the experiments of Ballard (himself an artist as well as psychologist) resulted in showing that between vividness and accuracy of visualization on the one hand and memory drawing on the other "no connection was traceable."² Contradictory results have come, so far as the present writer is aware, from nobody.

We seem then almost constrained to admit that even in the performances where introspection unanimously proclaims images to be useful, even there—and *a fortiori* in other performances—they really render little or no service.

Against drawing such a conclusion, only one objection seems to have been attempted. It has been suggested that images may render very great service, but still do so with equal efficacy even when they are of the poorest quality. This argument is more ingenious than convincing. For the best work is everywhere done with the best tools. If images are to serve as fixation points because of their superior stability, surely they ought to serve those individuals best with whom they are most stable.

Evidence of Deprivation. There is, however, a still more decisive procedure than that of correlations; it is that of deprivation. The effectiveness of a factor in any performance can be determined by executing such performance both with and without the aid of this factor. For devising and carrying out an investigation of this kind, the credit is again due to Martin. The experimental subjects were shown 150 different cards. Of these, fifty had to be reproduced in each of the following manners:

I. They were told to use whatever method they believed would be most effective.

II. They had to suppress all images altogether (this they are reported to have found themselves quite able to do).

¹ *Journ. of Phil. Psych. and Scientific Methods*, 1917.

² Paper read before the British Psychological Society, 1919.

III. They had, on the contrary, to reproduce the cards in as complete visual images as possible.

The comparative success of these three methods is given in the following table :

Experimental Subject.	Measure of Errors in Reproduction.		
	I.	II.	III.
Br. - - -	1896	1758	1917
F. - - -	1300	1407	1377
G. - - -	1420	1455	1488
Bu. - - -	1282	1493	1388
Wh. - - -	2058	2324	2101

The differences due to variation of procedure are of insignificant magnitude, as may be readily seen by comparing with the far greater differences between the experimental subjects.

Quite conformably with this result, Martin concludes as follows :

"The experimental subjects commenced with the traditional opinion, that the images would help them in reproducing the cards. In the course of the experiments, however, they became sceptical as to the power of images to inform. This doubtless arose from their fruitless efforts to produce a picture able to help them when they could not remember the card in a notional manner (*unanschaulich*). One subject said towards the end of this series :

'My opinion is that my images are only what I know, and that they do not always contain all that I know. So far as I am able to determine from these experiments, these images were of no use to me in any way.' "

Thus this investigation, the most conclusive of all as to the efficacy of images, would appear to be also the most adverse of all.¹

Our considerations have dealt specially with images,

¹ Indeed, its results are hard to reconcile even with the very subordinate efficacy still credited to them by the investigator herself.

because these have up to now been much most fully investigated. But the results of research concerning "inner speech" have been, so far as they have hitherto gone, quite concordant. The chief investigator of them, Reed, had to arrive at the conclusion—contrary to his own anticipation—that :

" The general conclusion which the tests in connection with the newspaper clippings point to is that inner speech has no important functions in comprehension in reading, and in writing."

As for the miscellaneous concomitants of thought, the muscular twitches, visceral discomforts, and so forth, it will perhaps be time enough to examine how useful these are when some one has made out an even serious case for their being so at all.

CONCLUSION

This concludes our review of the sentient; motor, and affective processes in respect of their function in thinking. From whichever side we have approached them, whether considering their influence at the moment of experience, or their mental trace after a lapse of time, their vigour of action on their own account, or their serviceableness as mere auxiliaries, and whether estimating the effectiveness by the method of trained introspection, by that of correlations, or by that of deprivation, in all cases alike the whole of the definite evidence available up to now would always appear to tell the same story. Far from such items showing themselves to be absolutely indispensable to the thought, they do not, according to this evidence, even render it any appreciable assistance ; the thinking seems to be no more based on them, than the heat of a fire is derived from its smoke, or an electric train is impelled forward by its wake of sparks ; the sensory concomitants of thought are degraded into little more than accidental waste products.

Is all this evidence trustworthy ? Have we here a new version of the tale of the pineal gland ? Does the thing

which for so long has been taken to be a peculiarly vital organ turn out to be after all an appendage of exceptional inutility ?

The decision on this question lies still hidden in the womb of future research. But if a response in the affirmative would at present be premature, so too at least would be one in the negative.

CHAPTER XIII

A GREAT ILLUSION

A PARADOX.

EXPERIMENTAL INVESTIGATION.

Confusion in Perceiving. In Reading. In Thinking.

"CONFLUENCE."

General Nature. First Condition. Second Condition. Third Condition.

CONCLUSION.

A PARADOX

THE preceding chapter has reviewed the available evidence as to how far images, verbal representations, movements, affective states, and so forth are connected with thought "functionally." This last word, however, has been used by us in its ordinary denotation, that is, as signifying the influence which the occurrence of one event exercises upon that of another. But now we may turn to another phenomenon included, apparently, by many psychologists under this same word ; it is a phenomenon strange to be so included, even stranger to occur at all, and perhaps most strange to pass everywhere without comment upon its strangeness. This is, that thought has been repeatedly declared, not merely to be *served* by its escort of images, etc., but actually to *consist* of such things. Between the two, thought and sentience, a relation of downright *identity* is asserted.

Take, for example, the already quoted introspection that an awareness of the sides of a figure having different shapes "*consisted* simply in fixating upon one corner." "Fixating" is an expression which signifies certain more or less conscious and intentional movements of the eyes, that result in shifting

the focus of the visual field to this corner. How in all the world can this plain event "consist in" that other event described as a noting of differences of shape? How, similarly, in another quoted example, is a person's "twitch in the finger" going to be identical with her quasi-ethical reflection on her previous conduct? Why not equally well say that black is white, pleasure is pain, and Yes denotes No? Even the introspectors themselves are occasionally constrained to add apologetically that what they observe seems to be absurd.¹ One is led to wonder why they do not make this admission consistently from beginning to end, and take it more to heart.

Less startling, but of kindred tendency, is the increasingly prevalent fashion of using the term "meaning." This is no longer confined to its ordinary and intelligible usage, that of denoting an idea which is, or may be, evoked and communicated by a word. It is introduced—arrayed in inverted commas, italics, and other marks of distinction—with an almost mystic impressiveness. It is allowed to appertain, not only to words, but also to any other constituent of consciousness. In the exceptional cases that definitions of it are adventured at all, these aim chiefly at denying to it any self-existence; it is said to be only some "peculiar character" of the alone really existent sensation that "means" it.

Now, shall all such surprising language be put aside as the mere product of theoretical prejudice and faulty observation? Most certainly not by the present writer, at any rate. The quoted introspections come from observers whose names must inspire universal respect, and whose works throughout bear the genuine stamp of painstaking conscientiousness. Moreover, it may be added, quite similar observations frequently occur in our own laboratory also.

Nevertheless, on the other hand, such observations do not seem to be rightly accepted in the usual offhand manner. We cannot so lightly believe that one bit of knowing actually

¹ See, for example, Fisher, *Psycho. Mono.* xxi. 1916, p. 45.

is another experience clearly different and even demonstrably independent. All such introspections may be true so far as they go; but they are evidently incomplete somehow or other. And the following is a preliminary account of an attempt to penetrate into the matter a little more deeply by means of experimental investigation.

EXPERIMENTAL INVESTIGATION

The commencement of such an investigation appeared likely to be made with most advantage, not in the sphere of thought, but in that of perception. One experiment of this kind, the most basal perhaps, and yet so simple that the reader can at once try it for himself, is the analysis of the perception of any ordinary material thing.

Confusion in Perceiving. For this was chosen a common matchbox, placed on a chair about a yard in front of the observer. The box was closed, with the striking surface in rear. The observer, comfortably seated, was told to look at the box deliberately, until he had ascertained and repeatedly corroborated the exact nature of his percept as such. For convenience, he was instructed that the part of the percept which could be ascribed to the direct result of visual stimulation would be denoted as the "sentient" part without prejudice to its real nature, physical or psychical. As regards the rest of the percept—should any such be manifested—the term "notional" was suggested as possibly sometimes applicable. Information was particularly requested as to the connection between this "rest" and the sentient part.

As observers, the kind services of Prof. Carveth Read, Mr. Flügel, and Dr. Phillips (in addition to my own) were obtained. This choice proved to be a fortunate one; for their introspections did not show themselves to support specially any views which they had advocated with emphasis before, either in public or even in private. If anything, their present observations and their previous views were rather in opposition to each other. Almost needless to say,

no findings of any observer (including myself) were ever communicated to, much less discussed with, any other observer. In general, every effort was made to avoid any suggestive influence.

Under such conditions, observer I. reported as follows.

“ The sentient element and the ‘ rest ’ all appeared as one fused whole. The sentient element ‘ meant ’ the rest. It *was* the rest, including my apprehension of the interior and rear face.”

Q. “ Would it be a correct description to say that the sentient part ‘ reinstated ’ its former context ? ”

A. “ No. In the first place, the ‘ rest ’ is no longer sensory as it was in former direct perceptions of interiors and rear faces of such boxes. In the second place, this ‘ rest ’ is now completely fused with the sentient element.”

Corroborating this, the report of observer II. ran :

“ I can scarcely disentangle the one from the other.”

Q. “ Which, if either, of the two following would you accept as a true description ?

(a) The non-sentient part is a prolongation of the sentient part.

(b) The sentient part is the whole box, including the other part ?

A. “ I can accept (b) unreservedly. There is no image of the interior of the box. These two, the fused sentient part with the awareness of the box, constitute the whole awareness of the box being there. I should not say that the sentient part ‘ means ’ the box, but that it *is* the box.”

Although, however, these two observers agree with one another well enough, this harmony is by no means universal. At such introspections the present writer, for his part, was quite taken aback ; to him, they were unintelligible. Look at the box as he would, he was unable to get any percept that

could possibly be described in such words. Fruitlessly for many days—in the laboratory and out of it—he tried every manner of regarding objects. At last, he did become able to perceive things in such a way that the above introspections became at any rate comprehensible. But his normal perception, in its leading features, is given in the following record:

"My percept is of a red and white rectangular, substantial, persistent, unitary 'matchbox.' This has a definite place, both absolutely in itself, and relatively to the other constituents of the percept.

The visible front cannot possibly be said to 'mean' the rest of the box, still less to *be* it. The back portion is distinguished from the front in nearly the same manner as one part of this front is from another part. It is not subordinate to the front, but co-ordinate to it. Either could with propriety be termed a prolongation of the other.

Nevertheless, the presentation of the back part could not properly be called a "sensory image." For it possesses no colour at all, even of the dullest and most confused nature; so that it lacks the essential character of visual sentience. But neither has it the character of any other sense, tactual, kinaesthetic, or otherwise. For this reason, although so definitely localized and in such intimate relation to sentience, I do not hesitate to describe it as a purely notional awareness.

As regards the detailed structure of the interior, the percept is meagre, obscure, and fluctuating. There is most of the time a vague presentation of the drawer. On the other hand, for instance, the box is either full nor empty, but in this respect quite undetermined.

From such presentation of a quasi-perceptual nature, there is a gradual transition to what might be called knowledge about the box. This is massive, wordless, very fluctuating, and all interfused. A few constituents are usually dominant, as, for example, that the box is

for the purpose of holding matches and that the design on it is very familiar. But in extreme grades of dimness, the amount of cognition present has a surprisingly large extent.”¹

Over and above such wide discrepancies in the ways of perceiving by different individuals, the experiments also revealed variations for the same individual. As just mentioned, I myself acquired the power of seeing in a new way by dint of prolonged effort. But with many observers, the manner of perceiving was liable to alter quite spontaneously. For example, on a subsequent repetition of the experiment, the observer I. (a psychologist of rare practice and ability in introspection) found himself adopting two different manners alternatively. The one resembled his former experience, whilst the other tended to be more like that of the present writer. His complete introspection was now as follows :

“(a) There was an imaginal supplementation of the sentient part, images of the invisible side being, as it were, projected into space and connected especially with the sentient part. At the same time, there was a notional element to the effect that these projected images corresponded with the reality. I am inclined to think that this attitude developed fairly slowly, and then persisted for a long time ; it seems to be a deliberate kind of attitude. In this case, it would be wrong to say that the sentient part ‘meant’ the rest ; it was now rather the images that meant the rest.

(b) The second attitude was less stable, and tended to develop into the one that I have just described. The connection of the sentient part with the rest is extremely intimate ; the degree of this intimacy varied ; at its maximum, there does not seem to be any distinction

¹ Although the spatial character was neither visual nor auditory, but a pure “thereness,” still its quasi-perceptuality makes it very unlike the “intellectual construction” as advocated by B. Russell in *Our Knowledge of the External World*, 1914, p. 114.

between the sentient part and the rest ; they are almost completely fused. I will perhaps not go so far as to say that the sentient part is the box, but it is part of an indivisible whole ; I cannot say where the one begins and the other ends. Such moments are usually very brief. They generally develop into the former where there is less fusion between the notional and the sentient parts. There seems to be an additional element of a very vague character, which comes into this second attitude, a notional element which supplies the connection between the known box and the sentient part. It is perhaps of the nature of a very rudimentary form of judgment ' that sensation is the box.'

This second attitude is the same as the sole one which I described on the previous occasion."

Q. " You speak of having ' images ' of the invisible side. Do you picture this side as coloured ? "

A. " Certainly, my image of it has colours. How could it be otherwise ? "

Q. " Can you explain more definitely what you mean by ' fusion ' ? For instance, does it at all resemble what may be called the *confusion* that occurs between the different partial tones of a musical clang ? Or does it more resemble what may be called the *interfusion*, which is said to characterize purely notional thought ? In the clang, but not in the thought, it is said, certain elements are not at the time apprehended distinctly from one another, although they are afterwards judged to have really been quite different.

A. " By fusion, I mean rather the *confusion* that occurs when hearing a clang than the *interfusion* that occurs in imageless thought. In the present confusion, certain elements are not at the time distinguished, although they are afterwards judged to have really been different."

We will next examine some perception of a rather more complex kind. Here, the observer was shown, in the same

manner as before, eleven of the matchboxes. Six of them had a chalk mark, as a sign that they were full of matches ; whereas the absence of such mark on the other boxes indicated them to be empty. He was asked to describe the character of his awareness of this mark acting as a sign. The relation between this sign and the information signified was, in particular, to be compared with the relation between the sentient part and the ' rest ' in the simple percept of a box.

The complete record of observer I. was as follows :

" There is first of all a temporal difference. The images in the percept of the box are present in consciousness simultaneously with the notional elements. Whereas the chalk mark has faded very considerably, whenever the notional element ' full of matches ' arises. There is a distinct step from the one to the other ; there are two easily discriminable states of consciousness. This is much the most striking difference.

I get moments, however, where there does seem to be a confusion ; the chalk mark and the notional ' full of matches ' form an indivisible whole, so that I might say that the chalk mark *was* the ' full of matches ' in just the same sense that the images meant the ' box.'

There is a more explicit stage in which the image and the notional element ' box full of matches ' are held somewhat apart, and are connected as a rule by a vague notional element corresponding to the rudimentary judgment ' this is the box.' This is just as I described in the first attitude in experiment one (that given on p. 199). But at moments, for a shorter duration, I get images much more confused with the notional elements. In fact, in its extreme form, it seems to be just the confusion of sentience with notional elements which I described as confusion before."

Q. " You have mentioned three different things as liable to confusion with notional awareness, namely, the sentient part of the percept in general, the chalk mark

in particular, and the images. Can you indicate any differences in the nature of these respective confusions as such ? "

A. " The three confusions seem to me *exactly* similar in quality. But they are all very fleeting."

. The general result of these experiments in the perception of material things, then, is abundantly to confirm the assertion—paradoxical as it may appear—that an item which is cognized sentiently can seem actually *to be* another item which is cognized notionally.

Indeed, this assertion appears to describe the present experiences far better than does the apparently more moderate statement, that the notional item is a " peculiar character " of the sentient one. All our observers agree in perceiving the box, not as any mere character of the sensation, but as a substantial thing. In fact, contrariwise, the sensation almost always appears as a character of the box.

Nevertheless, however true may be the paradoxical observation, it requires supplementation by facts which impart to it a very different colouring. Our experiments leave little room for doubt that such an identification of the sentient with the notional part of the percept does not occur always. In general, it was with our observers a phenomenon of brief duration and strange shiftiness. With some, it hardly occurred at all. It showed itself to constitute an extreme stage, from which there is every transitional grade down to the other extreme, where the notional elements of the percepts are just as distinct from the sentient ones as the latter are from one another. Above all, the said identification now reveals itself to be somehow or other of the nature of a " confusion."

Confusion in Reading. The next cognitive operation to be examined consisted in that of reading. In these experiments, the observer was given a book and asked to describe the nature of his awareness of the meaning, especially its relation to the visual sensations and to any motor-acoustic

verbal experiences. The following is one complete introspection :

“ It seems to me that there are more than one kind of relation, and this depends very largely on the speed of reading. In reading quickly, there is often a confusion between the sentient seen words and the notional elements, exactly like that which I have described before in the percept of the matchbox. In reading at maximal speed, there is distinctly a confusion between the visual sentient elements and notional elements. In reading more slowly, auditory motor images very frequently arise, and then the confusion is between *these* images and the notional elements. The notional elements themselves are clearer at this stage than at the former stage. I may perhaps say that the auditory motor images become more saturated with meaning than do the visual ones. If I suppress the auditory motor images, as I can do to some extent, the notional elements are usually less developed at the same speed of reading ; I do not understand the meaning as well. But when, under such circumstances, the notional elements do arise to the same degree of clearness as in the presence of the auditory motor images, then they are less confused with the visual sensation than they had been with the auditory motor images. In these rare cases, I think that I can detect the same process which I called a rudimentary judgment.”

Here is the introspection of another observer taken under similar conditions and presenting similar characters :

“ The visual sensations are certainly not the same as the sign of the matches (in the experiment where the full boxes had a chalk mark outside) ; they are far more intimately connected. There is certainly much more likeness to the other case (the simple percept of a match-box), but the union is not so close. When I fail to get the sense of the line, the distinction comes up much more

forcibly between the sensations and the meaning, and even afterwards the connection remains much less close than before. Until this happened I was inclined to say that the relation of the sensations to the meaning was just the same as that of the sentient part to the rest in I. (the simple percept of the matchbox).

On further trial there is a complete fusion, as I said at first. The fusion is with the visual sensations. The auditory-motor elements are distinct all the time. I think that in ordinary reading there is a confusion between the visual sensations and the meaning. This confusion seems somehow to be in addition to a clear distinction between the two."

The following is an extract from a record of the present writer :

" My understanding of the passage is not confined to the significations of the separate words, but forms a continuum, in and through which these significations are brought into mutual connection. The visual word seems at times actually *to be* its signification ; the two in a curious one-sided manner fuse together. But no such fusion takes place between the words and the remainder of the continuum of the thought ; this remainder appears to be, rather, a prolongation of the words. I should say that the words ' meant ' their own separate significations. But I cannot in the same sense say that any of the words ' meant ' the remainder of the thought."

With this may be contrasted the following two records taken from one and the same observer in immediate succession :

(1) " At the end of the sentence, the sentence as seen appeared to be indissolubly fused with the notional elements constituting its significance. But the last two words each had their own significance in just the same way, this significance being a limited one. The visual

signs constituting the word hypnotism really did constitute hypnotism ; they seemed *to be* hypnotism itself. In just the same way, the visual sensations constituting the whole sentence (most of them, of course, being in peripheral vision) constituted the whole thought corresponding to the significance of the sentence. All this applies only to a relatively brief moment as I finished reading the sentence."

(2) " Two or three words were distinctly in consciousness, and one visually perceived word, the word *psychotherapy*, stood for the corresponding notional element in much the same way as the auditory motor images stood for their notional elements in the last experiment. On the other hand, the words occurring at the beginning of the sentence had quite vanished from consciousness ; but there remained a perfectly clear understanding of the sentence as a whole, to the understanding of which there seemed to correspond no sensory or imaginal elements."

Thus, throughout these and all our other experiments on reading, a very close analogy is revealed to the perception of the matchbox. We find here just the same confusion between the sentient and the notional elements ; the former seem *to be* the latter. But we also find that here, as before, the connection between the two can become far less intimate. It can, upon occasion, tally excellently with the description given of the " signitive " functions of words by Husserl :

" Any objects or facts, of whose existence any person has actual knowledge signifies to him the existence of certain other objects or facts, in the sense that the conviction of the existence of the one is felt by him as a motive (and, in particular, a motive without insight) for the conviction or suspicion of the existence of the other." ¹

At other times the independence of the notional awareness can go much further even than in the case of perception ;

¹ *Logische Unters.*, 1900, pt. ii. p. 25.

the meaning of a sentence can remain clearly comprehended after all consciousness of words, images, or other relevant elements of experience has totally vanished.

More important still, however, is the fact that here, just as in perception, the identification of the sentient with the notional elements presents an extraordinarily irrational character. Besides being absurd in itself, it is continually fluctuating without any apparent rhyme or reason. Moreover, it is always found to be describable by the word "confusion."

Confusion in Thinking. After reading, let us take thinking. Here, a number of our experiments were made by the problem method due to Bühler. The observer was given some difficult sentence, and had to describe his experience of understanding it. The following is a typical extract from our records.¹ It shows a very intimate correspondence between the thinking and the language:

Task: "Is the following sentence true? 'To give every man his own, that would be to wish for justice and to attain chaos.'"

Introspection: "There were no visual images present at all throughout the experience, that I can remember. I seemed to take a very long time to make my decision. There were verbal images present all through, corresponding to all the thoughts. I do not think that there were any thoughts without verbal images, auditory-motor. In general, I have had imageless thoughts, but very rarely."

On the other hand, there are also abundant cases where such correspondence is absent. Thus, another observer doing the same task reports:

"As soon as the reading stopped, there was a period of considerable relaxation accompanied by the thought, which was quite wordless, corresponding to the words: 'I have now got all the data; I have to answer the

¹ The complete records are too bulky to be reproduced here. Sometimes a single one extends to as much as four pages.

question.' I then thought that this was a very similar problem to that which is discussed in Plato's *Republic*. I had distinct verbal images of 'Plato' and 'Republic,' and a visual image of men in Grecian costume sitting on marble steps. The words 'Plato' and 'Republic' seemed *to be* Plato and his Republic. I then had an unclear notion that the answer was in the negative. This notion seemed absolutely devoid of any sensory or imaginal elements, though the images previously described were still persisting. . . . I then had a clear thought that for the present I could give what meaning I liked to the word 'own.' There were vivid sensory elements accompanying this thought, but they seemed to be distinct from the thought, as it were epiphenomena, with the exception of the word 'own,' at any rate for a short time, seemed to be identical with its meaning."

Now, it will be remembered from the preceding chapter that the elements of experience alleged to form the substrate of thought were of three kinds, namely, images of things, words, and what we there called "miscellaneous" accompaniments, such as movements, organic sensations, feelings, and so forth. Of these three kinds, the first two have been exemplified above, and throughout our experiments they made their appearance abundantly. But there was a surprising dearth of the third kind. Our method of procedure was therefore modified by adding to the task the following instruction:

"After doing the problem, give as full a report as possible of all sensations, affections, and movements that seem to have had any connection with your thought. As a secondary task, and only so far as it does not in the least interfere with the first one, give also a report of the thoughts themselves."

On the whole, the results still remained unexpectedly barren. Here is an example of the reports given:

Task: "Do you understand the following? 'To

fructify the past and create the future, let that be my present.' "

From introspection: "Throughout the whole experience, the attention oscillated from the task to be performed to the bodily sensations. I cannot trace any definite connection between the sensations themselves and the thoughts, but I was conscious almost the whole time of my breathings, for instance, which seemed to me to be heavier than usual."

Occasionally, however, the effect of the new instruction did make itself more manifest, as in the following extract from another observer doing the same task:

"While turning to consider the second part of the question, there were movement sensations from the eyes, which were of very short duration, but very distinct; and also muscular sensations from arms and legs. These movement sensations, especially those from the eyes, carried a vague meaning to the effect that I was touching a fresh part of the problem. This 'meaning' was not a confusion. . . . The word 'create' in motor-auditory imagery stood out very clearly in consciousness, and for a moment it seemed *to be this thing itself, this process itself*; but this was of very short duration, and the thoughts became clearer and more explicit again, while the emotion diminished, but persisted in some degree to the end. . . .

I had a verbal image of the 'understand,' which carried at first a limited meaning, which gradually expanded until it included the whole of the task. The knowledge of the task seemed to hang upon that word. . . . The 'hanging' is not the same as being 'meant.' In the former case, there is some consciousness that the connection is merely a temporary one, not at all an intimate one, one that is convenient. An extra thought of the arbitrariness comes in.

Ultimately, there is only a quantitative difference

between all three cases ; the being that on which the notion 'hangs' ; the 'meaning' the notion ; and the 'being' the notion. I can imagine a continuous series."

Thus, our observations do corroborate the school which has claimed that thought can be introspectively identified with, can appear to 'consist of,' miscellaneous movements and so forth. To this, the further observation is now added, that an identification of just the same nature may take place between meaning and words, and again between the non-sentient and the sentient parts of percepts. But in our investigation, there was discovered in all cases a large variation between different individuals, and moreover surprising fluctuations and inconsistencies even for one and the same individual. The point, however, wherein our results diverge most widely from the structure-and-function school is that now this identification shows itself to be some sort or other of "confusion."

"CONFLUENCE"

Let us now submit this confusion to further scrutiny, bringing to bear on it any available light from other phenomena of psychology.

General Resemblance. We can see at once that it is no confusion of the ordinary kind. However strongly the introspector may insist that his thought is some "chaff and trumpery" of sensation, he nevertheless at the selfsame moment clearly shows himself to distinguish the two. When, for instance, he declares that his awareness of "not having pressed soon enough" actually consisted in an awareness of "catching the breath," these very terms of description indicate a perfect comprehension of and distinction between the two such widely different awarenesses. The one, he probably followed up by resolving to press sooner next time ; the other, by relaxing his respiratory muscles. A straightforward primary confusion of the two would not be committed by any person outside a lunatic asylum, or even

inside. The confusion first enters upon the scene in the secondary operation of deliberate introspection.

Now, such a secondary confusion is by no means an isolated phenomenon totally unlike anything ever occurring elsewhere. Events belonging at any rate to the same general category pervade, rather, the whole sphere of cognition. Take, for example, the well-known Müller-Lyer illusion, as shown in the two figures below.

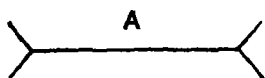


FIG. 17.

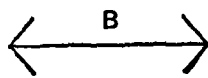


FIG. 18.

On comparing the lengths of the stems in the two figures, that of *A* appears actually *to be* longer than that of *B*. But beyond doubt, the apparent greater extension of the stem in *A* is really derived from the greater lateral extension of this figure, as a whole, including the terminal lines. Hence, the extension of the whole—consisting in terminals and stem with clear points of demarcation—must necessarily have been perceived first; the illusive extension of the stem must arise in a secondary manner. Such a secondary flowing together of what has just before been apprehended apart is technically designated as the illusion of "confluence."

Our example of this illusion has been taken from perceptual space, because this is the region where it can most easily be demonstrated and measured. But it pervades all other regions of cognition also, whether sentient or notional. Possibly of similar cognitive origin at bottom are many cases whose results are mainly affective or conative. To take a familiar instance, the same illusion may explain the greater friendliness commonly exhibited towards the postman than the taxgatherer. Every one begins by distinguishing perfectly well between, on the one hand the actions incumbent on these officials in the discharge of their duties, and on the other hand the good or evil consequences of these actions for oneself. But then, on further estimation, the apparent characters of the actions themselves receive a "confluent"

stream from those of their mere consequences. Among the more tragic manifestations of this illusion by confluence history displays the phenomenon of idolatry. Another manifestation that has had a wide social influence—especially in some countries—is the inordinate desire and respect for money.¹

First Condition. After thus noticing that the paradoxically concomitant distinction and confusion of sentient with notional awareness have at least some analogy with the widely spread illusion of confluence, the next step is to examine how deeply the resemblance between the two cases really goes. And for this purpose, the most convenient procedure seems to be an examination as to how far the two are governed by similar conditions. This task is greatly facilitated by the fact that the confluence in the Müller-Lyer illusion has already been submitted to very numerous and careful investigations. Of all these, none appears to have surpassed the work of Benussi;² this, accordingly, will be chiefly taken into consideration.

Now, the first necessary condition for confluence to occur is that the two confluent items should have some intimate relation to one another. In the Müller-Lyer illusion, the terminal lines are related to the stem by being parts of the same figure; and this relation was found by Benussi to be the basal factor. Similarly, the postman and the tax-gatherer, if they do not create their respective pleasing and unpleasing missions, at any rate carry them into execution. The effigy, if not identical with the deity, at least stands symbolizing him. Money, if not a great good in itself, still is often turned to good purpose.

Consider, then, in this respect the confusion between thought and its sentient concomitants. That here, too, an

¹ For many illusions of this kind in other sensory spheres, reference may be made to the present author's "Normal täuschungen in der Lagewahrnehmung," Wundt's *Psychol. Stud.* i. 1906, pp. 480-7. See also Krueger, *Phil. Stud.* xvi. and xvii.

² "Zur Psychologie des Gestalterfassens," pub. in *Untersuch. z. Gegenstandstheorie und Psychologie*, ed. by Meinong, 1904.

intimate relation exists is obvious enough in the cases of the images and the language. But it is not so evident in the case of the miscellaneous sentience. Yet even in this latter case it can be shown to exist. For the greater part of this miscellaneous sentience appears to *perform the office of gesture*. This will readily be admitted in respect of actual movements. On noticing a mistake, a person may have a "catching of breath" or a "twitch in the finger" in just the same way as he may frown or shake his head. Sentience, and even affection, can be employed in a similar manner by way of voluntarily *emphasizing* them. The following is typical introspection made by the present writer on the operation of understanding the word "tenable":

"On trying to pin down the actual nature of that item in my field of awareness which constituted my thought of 'tenable,' I found myself emphasizing a very obscure, faint, and coalescent mist of secondary visual sentience;¹ it had a certain relatively prominent but otherwise indescribable character. Whether it contained any verbal constituents, it is impossible to say; its whole nature was too obscure. But I was able to note that this mist arose slightly after the commencement of the thought itself. *I seemed to emphasize the thought by its means, much as I might do by a movement of the forefinger.*

The mist persisted—under my examination—long after the thought had completely vanished. It then seemed to be strikingly devoid of any significance; I appeared, as it were, to have jumped at a cherry, and to have found in my hand only a bit of leaf."

The kinship of this inner to the ordinary outer gesture is further shown by the fact of both gradually shading off into mere metaphor. For example, a short time ago the present writer happened to be considering the analogy between

¹ By "secondary" is meant, of the nature of "imagery."

integrals of complex number and curvilinear integrals where $\partial Q/\partial x - \partial P/\partial y = 0$. He detected himself emphasizing this equation to zero by means of a notional apprehension which may be rendered verbally and colloquially as "wash-out." This inner gesture might quite well have been replaced by an actual gestural movement of the hand from side to side, as often used to signal "wash-out" in musketry practice. But either the preceding inner or the outer gesture could equally well have been expanded into the formal metaphor that "All this array of values comes after all to nothing, as happens in a wash-out."

As for the precise nature of gesture in general, its derivation from such sources as analogy, convention, habit, or neural structure, its merely symptomatic as opposed to intentionally communicative function—all such questions of detail need not be entered upon here.

Second Condition. Such intimate relation between two items of awareness, however, although indeed necessary in order to produce confluence, is evidently not of itself sufficient for this purpose. Moreover, although this illusion has exhibited some striking qualitative resemblance to our confusion between notional and sentient awareness, yet the former phenomenon is far from equalling the latter one in degree. For whereas the terminal lines of the Müller-Lyer figure are only able to modify the appearance of the stem the sentient elements are able to dominate completely that of the notional ones.

On the general question of the modification or domination of one element by another, our deepest debt is to the great work of Wundt, where these two, modification and domination, jointly form one of the main pillars of psychology. He clearly shows that the two are merely different degrees of one and the same process. His favourite example of domination is the ordinary musical tone. Although this physically consists of, and also mentally can be analyzed into, many simpler tones of widely varying pitch, nevertheless the pitch of a particular one of these, commonly called

the groundtone, dominates by its obtrusiveness all the rest ; its pitch seems *to be* that of the whole. Similarly in the Müller-Lyer figure, Benussi discovered that the degree in which one item influences another is dependent on their comparative obtrusiveness (*Aufdringlichkeit*). Thus, the illusion was heightened when he rendered the terminal lines more obtrusive by giving to them a contrasting background ; on the other hand, the illusion diminished when he imparted obtrusiveness to the stem.

We have, then, to consider the comparative obtrusiveness, and the results to be expected from it, in the case of sentient and notional awareness respectively. On this head, there can be no doubt at all. In respect of obtrusiveness—which is approximately equivalent to our "cognitive intensity" (p. 159)—the sentient and the notional awareness stand at opposite poles. The former, even when of comparatively low determinateness, is still able to thrust itself into notice almost aggressively ; whereas the latter, even when of very high determinateness, is still so weakly conscious as to have often been entirely overlooked. This great difference between them appears to be at once accountable by the fact already indicated (p. 106) that the sentient cognition is derived immediately from real experience, whereas the notional cognition can only be derived from it mediately.

Third Condition. There still remains a third condition, and in some ways the most important of all. Benussi demonstrates abundantly—it is his principal theme—that the Müller-Lyer illusion does not depend basally on the sensations themselves, but on the *manner in which they are apprehended*. Even when the figure remains quite unaltered, yet, by a changed manner of apprehension, the illusion may be reduced or even dissipated. The change required for this effect is that the intentional apprehension of the figure should be concentrated on the stem, and correspondingly prevented from spreading into a collective apprehension of the whole figure, which would include, in

particular, the terminal lines in their relations to one another and to the stem.

Now, the analogous collective apprehension in our case (that of confusing sentience with notional awareness) has been shown to be that which is involved in employing the sentience as inner gesture. In order to prevent the confusion, then, the intentional apprehension should be as rigorously as possible restricted to the notional awareness, and correspondingly prevented from spreading over to the gesturally emphasized sentience.

CONCLUSION

If the preceding conclusions are correct, there would appear to have been unearthed somehow a grave matter. This introspective illusion, with its shiftiness and individual differences, would seem since the earliest times to have constituted an octopus, from whose stifling tentacles psychology has never been able to break loose.

One might not unnaturally have hoped that the illusion would quickly be extinguished in the atmosphere of modern research. But any such hope is damped by the excellent studies of Judd,¹ and especially of Lewis,² according to which the analogous illusion of confluence is only diminished, by no means eliminated, by the fullest knowledge of its existence. It can, indeed, be removed by practice; but this has been shown to be, in general, an extremely slow process. Still more disheartening is the discovery of Benussi, that even practice does not necessarily tend to remove the illusion, but may, on the contrary, heighten it. The direction of the effect of practice depends entirely upon which of the two manners of apprehension is adopted. That such increase instead of decrease of illusion by practice is possible for sentience and thought as well as for the Müller-Lyer figure, has already come to our notice on p. 198.

¹ "Practice and its Effects on the Perception of Illusion," *Psych. Rev.* ix. 1902.

² In the Laboratory of C. S. Myers, "Practice and the Müller-Lyer Illusion," *Brit. Journ. Psych.* ii. 1908.

Applying these lessons to the modern investigation of the part played by sentience in thought, it is evident that, whilst the one school is zealously adopting the one manner of introspective apprehension, the opposing school is adopting the other. Inevitably, then, instead of gliding into harmony, their respective assertions are becoming more and more irreconcilable. Whereas the one insists more unbendingly than ever that an awareness "of having pressed too soon" is "a twitch of the finger," the other school—notably Aveling and T. Moore—have so completely disentangled the two as to be able to enumerate a dozen descriptive differences between them.

CHAPTER XIV

EXPERIMENTS IN OBJECTIVATING

EXPERIMENTAL PROCEDURE.

Advantages. Observers. Meanings of Subjective and Objective.

DEGREES OF OBJECTIVITY.

Effect of Sense, Intensity, and Clearness. Distraction. Passiveness.

MIXTURE OF OBJECTIVITY WITH SUBJECTIVITY.

The Question. The Answer.

HOW SUBJECTIVE STATES ARE COGNIZED.

Contemplation. Retrospection or Subconsciousness ?

EXPERIMENTAL PROCEDURE

HERE, in the last chapter of the middle part of this work, we will pick up again a matter which in the first chapter of the same part had to be left incomplete. The promised evidence will now be brought forward, that in good truth—as asserted but never demonstrated by a long array of psychologists and philosophers from Plato onwards—the *primary* mental effect of any kind of sensory stimulation is what may properly be called a mental state. In this undertaking, we shall have to encounter the tremendous problem as to the origin, nature, and function of “objectivity.”

Advantages. Our method in this arduous venture will once more be that of experiment. Possibly, some critics will be inclined to resent such continual and unlimited preference given to this method. They may especially doubt its being advantageously applicable to the present matter, seeing that this already lies so open to examination by any one at any moment. They may ask why the experimental way of studying consciousness should be estimated any whit more

highly than the careful inner observation which has already been habitual among the ablest psychologists from the earliest times. How can any surpassing virtue, they perhaps think, be infused into such observation by labelling it as experimental?

In reply, the claims of the procedure to superiority would be based upon some such grounds as the following. Because it ensures that the statements are really derived from actual occurrences, whereas there is but too much reason to suspect that the pre-experimental alleged observation has been largely intermingled with logical and imaginative constructions. Because it enables the observations to be planned so as to vary only one main factor at a time, and thus reveal its influence unequivocally; whereas the casual observation as effected without experiment always encounters very numerous and for the most part unknown further factors varying simultaneously, and therefore can lead to no explanation except on the basis of assumptions and bias. Because it enables the topic to be treated systematically, so that the facts afford mutual assistance; whereas the casual observations are randomly scattered and as weak as twigs not tied together in a bundle. Because it furnishes records made (by shorthand) within the brief period—no more than a few seconds—during which alone an observer's memory has shown itself to be at all reliable; whereas the pre-experimental records have been noted down hours, days, and even years after the occurrence which they are supposed to depict. Because it presents to the observer the same event to examine again and again under constant conditions, until his judgment can be made with the highest attainable degree of certainty; whereas the older procedure was carried on under conditions always changing and therefore always finding the observer a novice at the particular kind of observation. Because such patient repetition of the same observation is as necessary to make a really fine introspector as the repetition of finger exercises is to make a fine pianist. Because the experimental procedure presents

the same events under the same conditions to several different observers ; whereas the older method leaves the matter at the mercy of a single person's fallacies and idiosyncrasies, enormously magnified by knowing that there is no other observer at once able to check them. Above all, because any subsequent investigators belonging to the most diverse schools of thought can at any time or place examine the issue of really similar arrangements ; whereas the pre-experimental arguers were for the most part like the two knights quarrelling as to the colour of a shield, whilst all the time viewing it from opposite sides.

Observers. The regular observers were, besides the present writer, Professor Carveth Read and Mr. Flügel, to whom are hereby once more tendered hearty thanks for their services. Occasionally, also Dr. G. E. Phillips and Dr. E. Bernstein were kind enough to give their assistance on particular points.

According to a prevalent view, the criticism might be raised that modern statistical methods indicate the need of the observers being far more numerous. But hereby, the theory of statistics would appear to be misinterpreted. Large numbers are only required—indeed, only advantageous—in certain cases ; they are so specially, either to eliminate “ random ” errors, or to prevent undue generalization. The present research does not suffer appreciably from either of these dangers. Not the number of the observers is here important, but their introspective ability and their mutual independence ; as regards the former, the names of the present writer's coadjutors speak for themselves ; whilst as regards the latter, none of us, fortunately, had ever discussed with one another any of the questions at issue. Large numbers should, indeed, be obtained eventually ; but then this should be done by means of entirely independent investigations in different laboratories. And the present research—of whose defects no one can be more sensible than their author—will by no means have failed in its purpose, if it does but incite other investigators to do the work again and better.

Meanings of "subjective" and "objective." The earliest task in the research was to get the observers to understand exactly what the terms objective and subjective were intended to mean. At first, the hope was entertained of effecting this by the mere experimental production of what seemed to the investigator to be conspicuous instances of each. But this device proved to be quite insufficient; and the results of the labour of many months had to be scrapped, on the ground that there was no way of ascertaining what the observers had actually meant when using these two terms.

Accordingly, the work was begun all over again, but this time each observer was supplied with a written list of the different ways in which it was anticipated (on the basis of the previous experiments) that the terms might possibly be employed. He was instructed to make his own usage unmistakable. These instructions ran as follows:

"Since the words 'objective' and 'subjective' have often been used to denote different characters, please make clear in each case whether you yourself denote any of the following characters, or some further one.

A. 'Subjective.'

1. Connected with the perception or idea of any part of your body.
2. Connected with an idea of your mental 'self,' 'ego,' or personality.
3. Actually constituting your state of consciousness, as when you say: 'My consciousness *was* that sensation.'

B. 'Objective.'

1. Connected with the apprehension of anything external to your body.
2. Meaning anything other than itself.
3. Localized in space.
4. Indicating a purely cognitive relation: 'contemplated,' 'intuited,' 'confronting you,' 'put before the mind.'

The characters more specially under investigation in the present experiments are : in the case of ' subjective,' sense 3 ; in that of ' objective,' sense 4."

DEGREES OF OBJECTIVITY

Effects of Sense, Intensity, and Clearness. The first set of experiments aimed at ascertaining whether objectivity (in the selected signification of the word) was a matter of all-or-nothing, or admitted rather of degrees. And to start with, it was desired to determine how far the objectivity is modified by differences of sensory quality, or of intensity, or of clearness.

For exemplifying the visual objectivity, choice was again made of a matchbox. This was placed near enough to the observer (about a yard off) to engender a stereoscopically solid appearance. Auditory sensations were obtained by means of a concertina, which proved to be very convenient for simultaneously varying pitch and duration. Tactile sensations were produced by pressure of a small flat cork surface upon the hand. Mixed tactile and organic sensations were got by pressing a cushion very firmly ; (a) over the top and sides of the observer's head ; (b) down upon his abdomen.

As a contrast to all these, subjectivity was exemplified by the pleasure derived from the pure tones of a musical chord given, in rapid succession upwards, upon large tuning forks. This was occasionally supplemented by unpleasure. To produce it, the last tone of the chord was unexpectedly replaced by a crashing blow upon a big tin box in proximity to the observer's ear.

Let us turn to the results. As regards the variation in sensory quality, sight showed itself to be for all observers somewhat more objective than sound ; sound, than touch. But there was, in general, a marked drop in the degree of objectivity on coming to the organic sensations.

The variation of intensity (within the range tried by us) exercised no regular effect. More often, perhaps, the

greater intensity went with a slightly greater objectivity. But in a fair minority of cases this was reversed.

Equally ineffective was the variation of clearness, in so far as characterizing different parts of the visual field. The peripheral parts proved to be as objective as those in the centre.

Distraction.—After this came two series of experiments introducing the factor of distraction. In the first of these, the observer became as absorbed as possible in reading a book, whilst simultaneously and continuously the concertina was sounded. In the other series, the observer gazed at a large sheet of coloured paper about two feet in front of him, whilst simultaneously he added together sevens aloud, as 7, 14, 21, . . . up to about 200.

Far more striking were the results obtained under these conditions. My own complete record is as follows:

(a) Sound and Reading.

"I found great difficulty in getting distracted from the sound (by the reading). And so long as the sound was of only moderate intensity, the distraction had merely the effect of driving it out of consciousness altogether. But when the sound was loud and the distraction nevertheless was effective as such, at these rather rare moments, I got a very subjective experience. The sound became my state nearly, though not quite, as much as in the other experiments my pleasure or unpleasure did" (see p. 221).

(b) Sight and Addition.

"The distraction was very imperfect. When it did become considerable, the result was usually that the colour almost or quite disappeared from consciousness. At times, the colour seemed, curiously enough, to become markedly paler. It hardly became subjective."

For another observer, whom we will call *A*, the complete record, after becoming practised in the experiment, was:

(a) Sound and Reading.

"The sound never disappeared from consciousness entirely. It fluctuated a good deal. At times, it was

almost excluded. On the whole, it was externalized. But it did at times make some approach to the subjectivity experienced in the pleasure. At times, it might have been going on in my head."

(b) Sight and Addition.

"The colour became vaguer and fainter and paler. It made some approach to becoming a state as the pleasure was." On another trial, "It was certainly less definitely objective."

For the other observer, whom we will call *B*, the complete record for Sound and Reading was as follows (that for Sight and Addition being analogous) :

"There were moments when the sound disappeared, but there were other moments when the sound was certainly in consciousness, but very much in the background.

"I find the subjectivity and the objectivity continually varying. In general, there is a correlation between the objectivity and the clearness in consciousness. When the sound was not at all clear in consciousness, it was subjective in sense 3. As it gradually became clearer, it seemed to acquire objectivity in all four senses. At the same time, the subjectivity declined ; but there was, I think, nearly always some slight subjectivity in sense 3. As the objectivity increased, with the increase of clearness, there came in a new subjective aspect in the senses 2 and 3. This at first seemed to apply to the same aspect of the experience as the objectivity ; but as the experience became still clearer, the subjectivity in senses 1 and 2 came gradually to apply to sensations in the head. These at the point of greatest clearness were distinctly differentiated from the auditory sensation itself, which was objective in all four senses, with a tinge of subjectivity in sense 3. This tinge perhaps vanished at moments of unusual clearness."

Thus, on the whole, distraction when of low degree fails to have any noticeable influence. When of high degree, it apparently banishes the sensory consciousness altogether. But between these two extremes, there is an intermediate phase where it tends to *reduce the sensory consciousness to a subjective state in sense 3.*

Passiveness. The following series of experiments was designed to make the observer vary the general character of his cognitive action. At times, he had to bring this up to a maximum ("attention"). At other times, on the contrary, he had to reduce it to a minimum, passively "giving himself up to" or "suffering" the sensory stimulation. Under these two conditions there were tried : (a) the sound of the concertina ; (b) the sight of a large sheet of violet-coloured paper ; (c) the tactile and organic sensory effect of pressing the cushion on the observer's head for 10 seconds.

In general the effects of such voluntary inhibition of cognitive activity were quite similar to those of the involuntary distraction. Here are some experiences recorded—and qualified as "fleeting"—by observer *B* :

(a) Sight :

"Consciousness was a green blur with absolutely no meaning. It *was* the colour."

(b) Sound :

"There seemed to be nothing in consciousness but the sound ; consciousness *was* the sound."

The other observer and the present writer gave results of similar tendency, but usually in less degree. The following is an instance, in the case of sound :

"Unless loud, it tended to disappear from consciousness. When loud, it for the most part tended to persist in undiminished objectivity. But occasionally, especially when I began to think about other things, it became subjective just as in the case of distraction."

In the above cases of sight and sound, the cognitive behaviour was of an active kind naturally, and an express effort was needed in order to bring about the passivity or mere "suffering." But this relation was interestingly reversed in the case of the cushion experiment (p. 221). Here, the natural tendency was rather to "suffer" the experience in a subjective manner. Quite an appreciable effort was found necessary in order to confront the sensation cognitively. But on doing so, the change effected in consciousness was far greater and more surprising than in any of the other experiments. Consciousness was described as being suddenly "lit up." The complete record of the change as experienced by observer *B* is as follows:

"In the first part, with normal attitude, the subjectivity and objectivity fluctuated very rapidly, the subjectivity as a whole increasing with the increase of the sensation. There was a very distinct subjectivity in sense 3. This held especially of certain feelings and emotional elements, especially of a slight emotion of fear. But this sense also held of certain sensory elements.

"These sensations were very massive and, for the most part, undifferentiated. It was these that fluctuated most as regards their subjectivity and objectivity. At one moment they were strongly subjective in senses 1 and 2, and also, to some extent, in sense 3. But they were also for the most part objective in senses 1, 3, and 4; and in periods, when this objectivity increased, in sense 2 also.

"On change of attitude, the feeling and emotional elements vanished. They came back occasionally in much less intense form. The sense elements on the change of attitude became differentiated, and were for the most part subjective in sense 1, but markedly objective in senses 3 and 4, and also to some extent in senses 1 and 2. At the same time, visual images arose, and these were markedly objective in sense 2, as meaning

something external to me and localized in outer space. The subjectivity in sense 3 vanished with the change of attitude. It came back occasionally for a short moment, but was then chiefly, if not entirely, confined to the feeling and emotional elements."¹

On the whole, the above results indicate that, in all departments of sentience, objectivity and subjectivity form what mathematicians call one single "connex"; that is to say, there is a perfectly continuous transition possible from any point to any other. Even the visual field does not always remain wholly objective, but can make an unlimited approach towards becoming the observer's mere state of consciousness.

MIXTURE OF OBJECTIVITY WITH SUBJECTIVITY

These difficult inquiries were pursued to a further stage. The continuous transition which we have just seen to occur between objectivity and subjectivity admits of being conceived in two different manners, simple and double respectively. As an illustration of what is meant by the simple manner, take the transition of a coloured point from red to green. Evidently, the red must finish its disappearance before the green can begin its appearance; there can be only one change going on at a time. Contrast with this the case of a dissolving view projected by a lantern on a screen; take, for example, a ship giving place to an aeroplane. This is effected by gradually covering up the lens which projects the ship, whilst at the same time uncovering that which projects the aeroplane. As result, the former is fading and the latter emerging simultaneously; the last vestiges of masts, funnels, and hull intermingle with the first glimmer-

¹ This conclusion appears both to be corroborated by, and to furnish an explanation of, various observations of other investigators. An instance is the discovery by Smith and Bartlett that in the case of very weak sounds "A certain summation of effects is required before an experience becomes definitely recognizable in terms of sound. But before that point is reached, some effect is certainly produced." *Brit. J. Psych.* x. 1920, p. 244.

ings of the planes, propeller, and car. To which of these two kinds of transition, then, should we liken that from subjectivity to objectivity?

It is the latter alternative that our introspective records, at any rate at first sight, strongly support. For they contain frequent statements that the percept is both subjective (in sense 3) and objective (in sense 4) at the same time. Here, however, a doubt can arise. In many cases, the subjectivity and the objectivity do not refer to the same element in the experience; for example, a visual image may itself be objective, whilst its feeling-tone is subjective.

To clear up this doubtful point, some further experiments were made, again using the method of applying the cushion firmly to the head (see p. 221), but now bringing the present question to special notice by means of the following instruction:

"Observers often report that an experience is simultaneously both 'objective' (in the sense of indicating the purely cognitive relation of being 'contemplated,' 'intuited,' 'confronted') and also 'subjective' (in the sense of actually constituting the observer's state of consciousness). It is desired to ascertain the following points:

(a) Do these two characters ever belong to the *same* element of the experience?

(b) If so, do they form two separate relations to this element, or do they fuse into a single one?"

Under these conditions, the following is the complete record of observer B:

"At certain moments, the two characters certainly belong to the *same* element of the experience, this element being the sensory one. At these moments, there seemed to be an unusually close fusion between the sensory experience and the feeling element. During the whole experiment, the feeling attitude was chiefly predominant, the cognitive attitude was adopted to

some degree for short periods. It was just at the moment when the cognitive attitude was beginning, that I found the two characters belonging to the same element of the experience, as just described by me. At other times, there seemed to be no objectivity at all. The pressure sensations *were* my consciousness, and a very unpleasant consciousness. At other times, again, the sensations were relatively objective in sense 4 ; whereas the feeling elements of consciousness were more or less held apart and kept distinct from the sensation ; the feeling elements being subjective in sense 3. The periods when the two characters belonged to the same element constituted an intermediate stage between these two extremes.

" I feel moderately confident that at the moment above referred to, the two characters formed two *separate* relations to the same element, and did not fuse."

Observer *A* confirms this, with the specially interesting note that the objective relation seems to " mask " the subjective one. The remaining regular observer, the present writer, had similar records.

The Answer. The answer to our question, then, must be that the transition from objectivity to subjectivity is not simple like the passing of red into green, but has, rather, a double character, like one view giving way to and partially overlapping with another one. This is especially noticeable in the case of the organic sentience, where the two rivals sway in uncertain balance, being for the most part confusingly intermingled. All our results indicated, however, that the same occurs also in respect of the visual, auditory, and tactile senses. Here, the objectivity was dominant, indeed ; but there could also be detected, under favourable conditions, a simultaneous subjectivity.

Moreover, it would appear doubtful whether the subjectivity ever really ceases at all. Whilst it is waning and the objectivity waxing, the former does not seem to be forcibly

abolished by the latter, but rather to be "masked" by it, in somewhat the same way that a weak tone is more or less overshadowed by a simultaneous strong tone without thereby losing its existence altogether. If this be so, the subjectivity must be taken as a primary character, and the objectivity as only something superposed.

A pretty corroboration of this analysis into the two constituent characters is afforded by the images of loud sounds. Strike a violent blow on a table with a book, and immediately afterwards call up an image of the noise. Note the manner of reproducing the original intensity. There is a curious doubleness about it; in some sort of way, the reproduction seems to restore the same great intensity as before; and yet in some other sort of way, the intensity has very much diminished. With a little care and practice, it becomes possible to discern that the restored intensity belongs to a cognition of the sentience as it was originally; whereas the diminished intensity is that of some still *actually persisting* though continually subsiding mere residuum of the original sentience.

Such objectivity is not the only thing that has been superposed. For when it is thus stript off, so are also certain other characters; these also, then, we have to regard as not being primary, but at some period or other superposed. For instance, under the experimental conditions (distraction or passiveness), the visual percept seemed to lose also its distance from the observer, and, indeed, its clearness of locality altogether. Further, all the character of "thinghood" tended to fade away. Another curious change was that the sensory qualities seemed not only to be less easily distinguished from one another, but actually to become less different. No such changes, however, appeared to be any constituent factor in the change to the subjectivity, but rather to be quite additional modifications.

Thus, then, the mental event asserted, more speculatively than evidentially, by such a long array of writers—the *πάθημα* of Plato, the "impressions" of Hume and most

associationists—receives finally an experimental corroboration. In further harmony perhaps with Plato, but in sharp contradiction with the associationism, such "impressions" are far from composing the whole of ordinary sensory perception. In this latter (at any rate when visual), they cannot be directly detected at all. They are, in truth, a much more primitive effect of sensory stimulation; and they can only be rendered introspectible by experimental devices which tend to reinstate a more primitive condition.

HOW SUBJECTIVE STATES ARE COGNIZED

So far in this chapter, we have been mainly occupied with the character of objectivity, and have been investigating this in the sphere where it is most conspicuous, *i.e.*, sensory perception. But now we will turn to examine the pendant character of subjectivity, and for this purpose will select as clearest examples the simple states of pleasure and unpleasure.

Contemplation. But we will keep in mind the likelihood of our results having a more extended application and, in particular, possibly even having bearings on the supreme question of the introspectibility of the *ego*.

The matter basally involved is as to whether mental states can really be "observed" or "contemplated"; or whether there does not instead exist some other and non-observational mode of knowing them, some more direct mode, such as has often been implied in the term "inner consciousness."

The latter alternative has received the well-known support of Brentano.

"The inner consciousness . . . must not be mistaken for an inner observation of our existing states; such an observation, rather, is impossible."¹

Here, even more than before, we must enter upon the experimental path with much diffidence, being, indeed, most

¹ *Psychologie vom empir. Standpunkte*, 1874, p. 119.

confident that it, and it alone, will lead to the goal eventually, but by no means sure that it will not take curious twistings and turnings on the way there.

In these experiments, the chord was played on the forks and allowed to ring out, unless stopped earlier by order of the observer. The latter received the following instructions:

“Determine and compare your different possible manners of cognizing the quality, intensity, and subjectivity of your state of pleasure.

The following are suggested as being manners of cognition whose possibility may be put on trial.

(1) ‘Feel and Say.’

The observer ‘suffers’ the state without objectivating it. He then knows what it was like without any special attempt to recall it.

(2) ‘Feel and Look together, and then Recall.’

The observer ‘suffers,’ objectivates, and knows, all at the same time. He then remembers.

(3) ‘Feel and then Look.’

The observer at the time ‘suffers’ only. Then he endeavours to recall, objectivating in so doing.

Order the stimulus to be repeated when you want it. Or say if at any moment you want it to be stopped.”

The following is the complete record—after the preliminary practice—obtained from observer *B*:

“I was endeavouring then to adopt manner 1. During the stimulus there was extremely little objectivation. Suddenly, I thought that I should be able to make a good judgment according to 1, and ordered to stay.

“There ensued, however, a period of some confusion. The judgment appeared to be just in process of formation, but was not completed, and I experienced some doubt as to the accuracy the judgment would possess when formed.

“Then suddenly the experience was involuntarily reproduced with some vividness. This reproduction

was a complex affair. There were fairly distinct auditory images. There was actual pleasure accompanying these images. These images and their accompanying pleasure were referred to the past experience; in some way, they were taken as representing it. At the same time there was a knowledge that I had experienced a certain amount of pleasure during the past experience. There immediately followed a judgment according to method 3. This judgment was principally determined by the last named knowledge factor. But the judgment appeared to be in some way made easier by the presence of the images and the actual pleasure."

A repetition of the experiment gave the following :

" This time I was trying to make a judgment according to method 2. The determining tendency to judge in this way appeared operative throughout the whole duration of the stimulus, but was not always equally successful.

" In the course of the endeavour to cognize the pleasure, it often happened that consciousness became for a time almost purely cognitive. I found that the pleasure tone had quite vanished. And I sometimes found myself cognizing the sensation instead of the feeling. At other times, it was the cognitive element which was reduced to a minimum.

" After one or two of these latter periods, there suddenly arose spontaneously a judgment according to method 1. At the time I did not recognize it as such a judgment, and it was of very fleeting duration. I merely knew with considerable confidence that I had just been experiencing pleasure of such and such a degree.

" In the case of the endeavour to get a judgment according to method 2, there was a gradually increasing effort with considerable muscular strain. The effort seemed directed to obtaining both the suffering and the

cognitive element in consciousness at the same time with the requisite degree of intensity and vividness. At last I did so, but only for a short moment. The suffering was quite intense, and at the same time was clearly cognized.

"This state of consciousness gave place a moment later to an almost purely cognitive phase.

"I think I had this judgment according to method 2 a good deal earlier. But I did not seem content with it, as neither the suffering nor the cognitive activity was present with what I considered a sufficient degree of vividness.

"In the effort to obtain both these elements with vividness, I seemed helped by a vague visual image of two persons, things, or animals facing one another, and by the vague idea that these represented, or were symbolical of, the state of mind I had to bring about."

Another repetition :

"I got the objective judgment by method 2, after a process very similar to the process gone through last time, but slightly shorter. The suffering was then cognized principally in the sense of being my consciousness, or at any rate part of my consciousness.

"There were also, however, at any rate for short moments, glimmerings of 'subjective' in sense 2, as belonging to me. And they were then cognized as belonging to the *me* that was cognizing. That is, I was a cognizing I. I was looking on something that was a part of me and belonging to me."

We may now turn to the complete record obtained from myself.

(1) *Instructions* : "Try the 'Feel and Say' method. The observer 'suffers' the state without objectivating it. He then knows what it was like, without any special attempt to recall it."

Introspection : " I found *two* quite different attitudes possible, of which the first was that of waiting to suffer the feeling, whilst the second was that of actively cognizing the tones. I got far more pleasure out of 2 ; but here the pleasure was projected into 'pleasantness' of the tones. I could, however, get a lot of pleasure by first attending to the tones and *then* letting the pleasure 'soak in.' The pleasure is then very purely subjective. I can at once say that I am enjoying myself. But I find a great tendency to introspect before answering, instead of answering at once.

" There is a certain tendency to *infer* that one is enjoying oneself ; such an inference is derived from the apparent pleasantness of the sounds, and does not constitute a direct cognition of the pleasure. But still the direct judgment that one has had pleasure is also quite possible. It generally gives different and smaller estimates of the pleasures than does the inference.

" The 'pleasantness' of the tones appears to be in large measure a cognitive judgment of 'sweetness' and 'purity' together with conative and emotional experience corresponding nearly to the words 'I like that,' 'I am fond of that.' "

(2) *Instruction* : " Try the method of 'Feel and Look together and then Recall.' The observer 'suffers,' objectivates, and introspects all at the same time. He then remembers."

Introspection : " I certainly can *judge* that I am enjoying myself, and also what kind of state such enjoyment is. But I doubt whether the pleasure is viewed objectively before the judgment. I should say, rather, that the subjective state gives rise to the judgment.

" But I am rather inclined to think that the objectivity of the pleasantness tends to make the pleasure seem objective.

"I got, like a flask of light : 'That is not pleasant,' just as I lost the tones from consciousness in thinking about the matter. That time, I did seem very clearly actually to 'look at' the pleasure at the very moment of highly enjoying it."

Owing to this distinction found possible between "Pleasantness" and "pleasure," the following further experiment was made with observer *B* :

Instruction : "Can you distinguish the pleasure of hearing from the pleasantness of the tones? If so, try to analyze the pleasantness."

Introspection : "All I can say at present is that there does appear usually no such distinction. At times, however, there was an approximation to it. At such times, the tones themselves were rather markedly objective, and they themselves seemed to be pleasant. The pleasure was *referred* to the tones that were arising, as it were, from outside space.

"Meanwhile, there were also some organic sensations fairly prominent in consciousness. These were subjective in the sense of belonging to me, forming part of my consciousness. These were also, for the most part, pleasant, and the pleasure belonging to them, and referred to them, was to some extent distinguished as being less intimately connected with one's own consciousness than was the pleasure of the tones.

"At other times, the tones did not seem to possess any pleasantness that was distinguishable from the pleasure of my own consciousness."

A repetition with *B* gave the following results, but this time he was expressly instructed to cognize the tones objectively if possible :

"When the attitude was successful, there was no pleasantness of the tones as distinguished from the pleasure of my consciousness. When and in so far as

there was pleasantness connected with the tones, there was a departure from the cognitive attitude. This happened just after the striking of each note, when there was a sudden wave of feeling which made it impossible for a time to keep to the cognitive attitude. At these moments, there was undoubtedly a pleasantness that was connected with the tones. I think that this pleasantness can be distinguished from the pleasure of my consciousness."

Summing up this evidence as to the manner in which pleasure and unpleasure enter consciousness, we are once more compelled to conclude that the simple undergoing or "living" such states is fundamentally different from knowing them, either in respect of their character or even of their occurrence. The knowing is a separate operation, presenting often extreme difficulty, and affording very large scope for improvement by practice. On behalf of the view that the cognition of mental states is "infallible," our work has produced no support whatever. Very important also would appear to be the fact observed, that both a mental state itself and also the observation of it admit of an unsuspected diversity in manner of occurrence; some phenomena can only be caught under one "mental attitude," others under another.

The chief new point resulting from the present experiments is that, although pleasure and unpleasure usually occur in a manner fairly describable as "subjective," nevertheless many persons—with sufficient training, perhaps nearly all—are able to render even these affective states "objective" at the very instant of their occurrence. Nor must this be mistaken for the various possible quasi-objectivations. It is quite different, for example, from that involved in the not infrequent projection of the sensory feeling-tone upon the sensory percept itself, whereby the pleasure gives rise to an apparent "pleasantness." Again, it is no less different from any posterior objectivation of the feeling by a judgment, as when a person indicates to himself, "I am enjoying that."

The fact here cited is none of these things, but a genuine objectivation of the pleasure at the time of experiencing it. It is a case of the very "observation of our existing states" declared by a too sweeping generalization to be impossible. It is not even always confined to obscure apprehension, such as occurs in oblique vision, or in the thoughts popularly described as being "in the back of one's mind." On the contrary, it can attain to a surprising degree of clearness. To this extent, our results are decidedly with Hamilton, against Comte and Brentano.

Retrospection, or Subconsciousness? We did not, however, find this objectivation to occur always, but only sometimes. The further question must, then, arise: In what manner, when the experience was reported to have been solely subjective, did the observers ever come to be aware of having had it? And this question about pleasure can be repeated with reference to the sensory *παθήματα* reported on page 229. In what manner must this, too, be taken to have been cognized? Do we really possess, as has been asserted, some second radically different power of cognition, something of the nature of the alleged "inner consciousness," which is able to operate *without* objectivating?

With this problem, we might seem to have reached the most formidable of all difficulties in introspection. But, like the fourth knight guarding Castle Perilous, instead of really "closing in itself the force of ten," this final opponent showed itself on actual encounter to be but a comparative weakling. Another experiment was made, in which the following instructions were issued:

"You have reported several times that you have experienced pleasure subjectively and then have remembered that you had done so. If such a case arises again, see whether you are always aware of the pleasure at the moment of experiencing it, or whether you can ever 'live' it without really being aware of it at the same time."

After careful examination and repetition, the verdict of *B* was as follows :

" It seemed to me that I simply lived the pleasure without being aware of it, my awareness being entirely occupied with the tones themselves. A moment later, I became very distinctly aware that I had just experienced pleasure."

On further repetition :

" I got it for a moment then very distinctly. For a moment there was a high degree of pleasure quite subjective and not at all cognized, my cognition being directed to the tones."

For the other observer, the instructions were somewhat modified, as follows :

" Use the ' Feel and Say ' method and try to answer specially the following question. When the state is purely subjective, is there any sort of knowledge at the time ? Or is the awareness of it purely retrospective ? "

His answer—to his own no small surprise—was :

" I am inclined to think that there is *no* sort of knowledge at the time."

Another repetition :

" Yes, I again think that there is no knowledge at the time."

Another repetition :

" Yes, the same result again."

Several more trials .

" I am now very confident indeed."

Thus, the reply to the inquiry, as to whether there exists any special " inner consciousness " acting in a more direct manner than by objectivation, can only, so far as the preceding evidence goes, be negative. There does, indeed, appear to exist a possibility of " living " or " experiencing "

a state—even intensely—without at the time having any objectivating awareness of it discoverable by means of introspection. But in such case, neither can any other kind of cognition of it be discovered introspectively as occurring at the time; instead, there is only a posterior remembrance, that the state occurred and that it was *not* cognized at the time.

Here, however, an alternative possibility suggests itself. This is that perhaps the state was really cognized at the time in the usual objectivating manner, but this cognition itself could not be cognized introspectively. The case would then only be one more instance of a cognitive act itself falling below the limen of introspective apprehension (p. 164 ff.).

Yet further questions readily suggest themselves. One may, for instance, ask whether this unintrospectible manner in which a state can be apprehended (that is, either retrospectively or subliminally) is also the way in which the *ego* apprehends its own self. Or does there, perhaps, in this one single case really occur a special, direct, non-objectivating “inner consciousness”? Even to these hard problems—however insoluble by the unaided older method of bare excogitation and discussion—there will eventually beyond doubt be obtained a definite answer from the developments of the more potent experimental method. For the present, however, we appear to have secured all that was imperatively needed, namely, some definite evidence as to the most primitive nature of sensory cognition.

PART III

APPLICATIVE

CHAPTER XV

PERCEPTION AND MOVEMENT

PRESENT TOPIC.

Reduction of Powers to Principles. Pre-cognitive Phases.

MAIN PHASES OF PERCEPTION.

Apprehension of Sentience (Quality, Intensity, Spatiality). Education of Relations. Sensory Supplements. Metaphysical Supplements.

SUBSIDIARY PERCEPTUAL OPERATIONS.

Further Education of Relations. Associate-correlate-evocation. Simple Reproduction. Gradualness of Transition.

MOVEMENT.

Bodily. Cognitive.

PRESENT TOPIC

IN this third and last part of the volume, the principles which we have set up will be illustrated by application to the most important analyses which psychology has provided hitherto.

Reduction of Powers to Principles. In such previous theory, the dominant doctrine—undisturbed save for some divagation into associationism—has invariably been that of certain basal cognitive *faculties* (p. 25). And these latter have almost always been reduced to some or all of the following four: Perception, Intellect, Memory, and Imagination. Any further reduction has, in general, only been by way of subdivision within the same framework. At times, especially in the most

ancient and the most modern literature, a small addition has been made in respect of Movement.

Such faculties, although now having to be deposed by us from their unbroken reign in psychology, nevertheless still do possess and will retain no little subsidiary value. They provide at least a preliminary sifting of a large quantity of facts. And they also offer a convenient bridge for passing over from the scientific handling of the topic to the cruder notions in popular currency.

Some Recapitulation. As regards the principles here put forward instead, three, called "noegenetic," have been formulated as governing primarily and qualitatively all genuine knowing and all growth of cognitive content; they are those of apprehending *Experience* (p. 48); of educating *Relations* (p. 63); and of educating *Correlates* (p. 91). In all three, the growth takes place by way of continuous *Intensification* and *Determination*, which latter affords scope for *Differentiation* (p. 159). Each of these principles comes to manifestation in a definite process peculiar to it. To them must be added five other principles, which do not regulate the quality of cognition, but only the quantity (p. 129). They serve further to originate three additional processes, those of *reproduction*, *disparition*, and bare *clearness-variation* (p. 137).

Keeping these few points in mind, we may turn to the main work, that of reducing to terms of our ultimate principles the facts which cruder analyses have endeavoured to bring to expression as manifestations of divers faculties.

Our application of these principles will begin, naturally, with the faculty of sensory *Perception*. Here, however, before any cognition at all can come into play, there must occur certain events which are not themselves cognitive, but only supply the soil out of which cognition (by virtue of the first noegenetic principle) originally springs (p. 47).

These pre-cognitive events have themselves two distinct stages, of which the first is pre-mental altogether, being

purely physical and physiological. Any of the afferent nerves—many millions in number—may be thrown into excitement, in some cases by forces impinging on them from the external environment, and in other cases by the movements of the organism itself (Ch. III.). These neural excitations are next, whilst undergoing complex groupments and regroupments, transmitted to some centrally situated cerebral region which has been named the "sensorium."

Then follows a stage which is indeed mental, but nevertheless not yet cognitive. The physiological processes in the sensorium by some utterly mysterious means generate sentient states of mind. Such states are, at starting, merely "lived," and not yet also known. They usually pass from zero of intensity to its maximum with great speed, probably in less than $1/5$ of a second (p. 161).

MAIN PHASES OF PERCEPTION

Apprehension of Sentience. Now commences the actual cognition. Already whilst the merely "lived" sentience is still in the course of its swift rise towards the maximum, there can supervene another process of very different order, namely, an apprehension of the occurrence and nature of this sentience (p. 161).

With little less speed, the apprehension itself gains intensity as an experience in its own right. Less rapidly, it gains also with respect to determinateness. At the absolute start, we must take it to be not determinate in the least degree (see p. 159), and therefore wholly undifferentiated (p. 160). The corollary ensues that at this limiting point, the awareness derived from the several senses—sight, sound, taste, smell, etc.—must always be perfectly alike. Indeed, we have seen indications that not only the awareness of the sensory characters, but even these characters themselves, start with being alike for the different senses and need some lapse of time, however minute, in order to grow different (p. 229). In the case of central vision, the

period requisite for growth to the greatest degree of determinateness (and therefore the greatest differentiation of which it is capable) would seem to be about one second (p. 161). For peripheral sight and for the other senses, no exact measurements appear to have as yet been attempted.

This view, that the characters of sentience are directly apprehended, offers little difficulty in respect of quality or intensity. And an attractively simple solution would be to take also the character of spatiality as being apprehended, just like the other two, directly by virtue of the first principle; we could then say, with J. Müller, that the nerves become aware of their own extension. The chief obstacle to this easy solving of the matter comes from psycho-physiology; the apparent place of any item of sentience does not, like the other two characters, show itself to be a one-to-one function of any single nerve; it derives, rather, from a complex system of them (p. 40).

The explanation preferred by the present writer has been set forth by him in detail on previous occasions;¹ and the evidence then adduced on its behalf could now be much strengthened by application of the since discovered principles. But for the present, it must suffice to suggest in general, that the apparent places of cognitive items may really be the resultants of complex interactions between their original localizations.² With respect to these latter, the thesis of J. Müller may possibly after all be valid. Mutual interaction of analogous kind is, in point of fact, by no means an uncommon event. An instance has been cited already, the interpretation of simultaneous colour-qualities, each not in its absolute value, but as relative to all the others (p. 169). Further instances, and especially concerning spatial perception, will come to notice a few pages later.

Eduction of Relations. Herewith, Perception advances a

¹ See especially "An 'Economic' Theory of Spatial Perception," *Mind*, xvi. N.S. 1907.

² Inclusion must be made, not only of these noegenetic interactions themselves, but also of the associative reproductions that eventually derive from them.

phase further. For as the basis of all the said mutual interaction, and indeed of all cognitive growth whatsoever beyond the manifestations of the first principle, there must supervene those of the second. Items of experience brought originally to awareness by virtue of the first must proceed in their turn by virtue of the second to evoke awareness of *relations* between themselves (Ch. V.).

Once more, the passage from the earlier to the later phase appears to happen most quickly and inevitably in the case of vision. For instance, it is scarcely possible by any effort of introspection to distinguish the moment when adjacent visual positions are perceived in themselves from the moment when they are perceived in the relation of nearness to each other. But such impossibility at once disappears on turning to any relations less easy of cognition. To perceive, for instance, the apparent absolute positions of three not very adjacent spots is almost always a distinctly earlier performance than to perceive whether or not these positions lie relatively to each other in a straight line. Indeed, the latter perception may occur an indefinitely long time afterwards, or never. And on turning to the relations of likeness (including difference), these are still more frequently cognized at a noticeably later moment than their fundamentals.

At this point, a word may be interposed on the much discussed question of perceptual "unity." Really, two curiously different sorts may be observed to occur in sequence. At the very beginning, whilst still at the phase of mere lived experience, the mental effect of every sensory stimulation would appear to have in large degree a *disunited* existence; each such effect is a different mental item.¹ But the next phase, that ensuing by virtue of the first noetic principle, commences with a cognitive field of completely undifferentiated confusion (p. 242), and therefore constitutes a perfect unity.²

¹ Thus the "Manifold of pure presentation" advocated by Kant (*Krit. d. r. Vernunft*) is here replaced by a manifold of lived experience.

² With this compare Kant's "synthesis by the imagination" "which does not as yet give any knowledge" (*ibidem*).

Then next, in so far as any item in the field becomes differentiated from the remainder (still by virtue of the first principle) it is to that extent divided from that remainder, and so disunited again. But when, finally, by virtue of the second principle, such disunited items are apprehended in relation to each other, they are thereby brought into unity once more, although this time of an entirely different kind, being no longer due to the backward but to the forward stage of cognitive growth.¹

This secondary unity, constituted by awareness of relation, does not, like the original unity of mere confusion, spread itself evenly over the whole mental field ; it settles, rather, in several patches, none of which are much related to any other one, and some not much even within themselves. The most conspicuous of these related patches of cognition is the field of vision. Here, the unity conferred by perceiving relations would appear to be the main fact responsible for the so frequent experimental report that a picture is "from the very first seen as a whole" (p. 169). Another such patch, thinly related to the visual one, and not always very closely related within itself, is the field of sound. Still scantier become the relations, both intrinsic and extrinsic, on passing to tactual and visceral sentience. Taste and smell tend to form one single loosely inter-related patch, which is often, though in a somewhat fitful manner, related also to sight and touch.

Sensory Supplements. We now arrive at the third main cognitive phase involved in forming ordinary sensory percepts ; it may be called that of *supplementation*. Our examination of it can here be curtailed, thanks to the detailed study made already in the example of perceiving a matchbox (Ch. XIII.). We noted how the directly visible front of the box excited a supplementary presentation—with or without imagery—of the remaining sides, drawer, etc. A supplementation of this sort has in another chapter (X.) been shown to consist, not in any bare reproduction (as often assumed),

¹ At this third stage, the breach with Kant greatly widens.

but rather in a *construction by analogy*. This brings the operation into line with the test of Analogies, in that *two* distinct evocations are required : first, that of a relation (or system of such) ; and then that of a correlate (p. 145). But there is a difference between the two cases ; in the test the relation is directly educed ; whereas in the perceptual supplementation it is associatively reproduced, there being a reinstatement of the relation (for example, in respect of perspective) which any previously seen partially similar fronts of other matchboxes bore to *their* remaining sides, etc. Such reproduction of the relation will not, in general, be introspectible as a separate process ; but reasons have been given for nevertheless inferring it to occur. The rest of the perceptual operation is obvious enough ; the reproduced relation, together with the front actually visible, proceed to evoke the correlate, namely, a *new* set of remaining sides, etc., specially fitted to the front now visible.

With regard to the range of such originative supplementation, it is ubiquitous. Lead the youngest schoolboy through the most unfamiliar scenes ; take him to the most exotic fauna and flora in the zoological or botanical gardens ; let him gaze at the most extravagant spectacles of the cinema ; show him even pictures of monstrous fairy tales. In not one single case will he be reduced to the necessity of appending to the actually sentient constituents of the percepts any *bare reproducts*—always necessarily more or less misfitting—from his own past experience. The Japanese dwarfed-tree is not obliged to appear as if having its rear face a hundred times too large ; nor does the view from an aeroplane need to supplement itself with an interior as viewed in the usual manner horizontally.

Of course, there is no reason why such a supplement should always have any counterpart in reality. It certainly does not do so, for instance, when the stump of a tree is taken by an over anxious sentinel to be an approaching enemy, or when a dimly seen towel hanging up to dry is apprehended as a spirit from the dead. Similarly illusive are the

perceptual supplements evoked by the devices of the conjuror, such as pocketed aprons, tables with secret shelves, or the more complex arrangements of "Pepper's ghost."

All the preceding examples have been, at least in part, of a spatial nature. But this need not necessarily be so. Among classical instances other than spatial are those where sentience of one kind evokes sensory characters of different kinds; shining metal "looks" hard and cold; chocolate "smells" sweet, and so forth; such illusions can, as is well known, have hallucinatory vividness.

Metaphysical Supplements. As described so far, the directly perceptible sensory characters (space, colour, etc.), become supplemented by others which are of the same general kinds and therefore also sensory. But external percepts actually contain, over and above all such, yet further characters of a very different kind; these cannot well be called sensory at all, but might perhaps be given the name of metaphysical. The problems they involve are not only extremely difficult and disputed, but also have their chief interest from a theoretical rather than practical standpoint. Nevertheless, for completeness, a brief suggestion may here be offered as to possible lines of explanation on the same principles as heretofore.

We may take, to begin with, the fact that every person lives, so it appears to him, amid other persons. That is to say, certain of the objects around him have the appearance of being entities that, like himself, think, feel, and strive; in a word, they *look conscious*.

The explanation currently rendered of this fact is that, since a person's own sensations cannot by any possibility contain the consciousness of any one else, the seeming percepts of surrounding conscious entities must necessarily have been constructed out of previous awarenesses of his own consciousness. And so far, this current explanation stands upon ground that, in the main, is solid enough.

But then, most often the further explanatory step is taken of assuming that the said construction must needs be effected

by means of associative reproduction. The sight of external gestures is asserted to evoke in the mind of the perceiver the emotions by which such gestures were accompanied formerly in his own case. Similar associations are alleged to be established with the expressions other than gestural, such as the sparkle of the eyes, the lowering of the brows, and so on. Now, all this must here be rejected as decidedly incorrect. The characters of consciousness expressed in gesture or countenance are notoriously far from being strictly confined to the previous experiences of the person perceiving them. On the contrary, they may appear to him most strange; in no instance, probably, are they *precisely* the same as any previous experience either of himself or even of any one else. On picking out the constituents that really do remain constant in the impressions conveyed to any perceiver by the facial expressions of others—and that therefore do admit of being explained as bare reproducts—these constituents prove always to be relations only. For example, there is usually a quantitative relation between the brightness of eye and the vivacity of consciousness. Hence, when once any degree of brightness has been apprehended and the said quantitative relation has been reproduced, then the corresponding degree of vivacity may come to awareness as the correlate; this can happen whether or not such particular degree of vivacity has ever been experienced or mentally presented before.

But if this be so, then the form of the operation of perceiving conscious beings as such is after all no other than that already described in the case of the matchbox. There is again an intimate blend of two processes, of which the first is the reproduction of a system of relations, whilst the second is the eduction of a correlate.

Let us turn, next, to the appearance presented by *inanimate* things, namely, that of *unconscious substances*. Such an appearance need not be regarded as entirely different from the just mentioned animism, but with greater probability as only a special case of it. No person, we must

indeed admit, would ever be able to perceive unconscious material things as such merely by virtue of *reproducing* any awareness of his previous experiences ; for this awareness could never possibly have included any unconsciousness. But he could quite well have such perceptions by virtue of correlate-finding ; for when once certain characters of gestural movement have come to be taken as related to the degree of consciousness of an underlying psyche, then the *opposite* character in respect of movements will, still by virtue of just the same relation as before, now produce as correlate the opposite to a conscious psyche. And this is the very clodlike substantiality which the percepts actually exhibit. From such a point of view, be it remarked, the animistic perception of external objects as conscious entities would not be a later but an earlier development than the perception of them as lifeless matter ; and this sequence seems to agree well enough with the actual findings of comparative psychology. Latest of all, inspired by seeing apparently the same external bodies sometimes as animate and sometimes as inanimate, would naturally arise the perception of them as partly spiritual and partly material.

There yet remains for consideration the appearance of *force* exhibited by external objects. Material things do not look like wraiths coming, meeting, and parting ineffectively ; they seem, rather, to be impelling or obstructing one another. A billiard ball has the appearance of being driven forward by the momentum of the cue, and back again by the resistance of the cushion. A torpedo tears open the side of a ship with what seems to be an explosive violence. Commonly, much or all of such appearance has been attributed to mere reproduced muscular sensation. But on actually stimulating the muscular sensory nerves (electrically) and examining the precise nature of the whole gamut of sentience which they are able to afford, the present writer for his part can discover no muscular nerve, or combination of nerves, that yield any sentience even most distantly similar to resistance. We are obliged, then (waiving the hypothesis

of innate percepts) to fall back on the fact that among the constituents of every person's experience there is a peculiar one called *mental effort*. By means of reproduction plus correlate eduction, such awareness of exerting mental effort would be capable of originating the appearance of external force in just the same manner as the awareness of being a conscious mind was shown above to be able to originate the appearance of external matter.

On the whole, then, all these metaphysical supplements, these investments of a percept with apparent consciousness, substance, and force, seem to be attributable to operations of just the same form as the sensory supplements described minutely in the case of the matchbox.

Herewith sensory perception completes what may be called its essential tripos, as summarized in the three words, *sentience*, *relations*, and *supplements*. In respect of "form," such supplements include two distinct steps, the reproducing of relations and the educing of correlates; in respect of "material," the supplements involve two different classes, the one sensory and the other metaphysical.

SUBSIDIARY PROCESSES

Although the preceding account would appear to comprise all the processes strictly necessary in order to attain to the perception of material external objects, yet usually there occur many further processes of what may be called subsidiary order. Even these, however, for the most part, have exactly the same form as those which we have just examined, namely, either that of educing relations, or else that of reproducing relations and then instantly educing correlates.

Further Eduction of Relations. Thus, there may be relations educed, not only of the straightforward sort considered so far, but also of any of the special and usually more complex sort discussed in Ch. VI. For example, instead of the

seeming fundaments of the relation being operative themselves, their function may be taken over by substitutes or by secondary impressions ; an instance is when apparent comparative extents of length are really derived from comparative durations of time (p. 85). Again, the relations may be built up on successively higher and higher levels ; when once the originally experienced items of sentience have produced awareness of their inter-relations, then these latter themselves may produce awareness of their own inter-relations, and so on (p. 82). Or, when the basal processes have produced awareness of correlates, these latter too may serve as fundaments for further relations on higher levels. To such an origin may be ascribed, for example, the utterance : " The voice is Jacob's voice, but the hands are the hands of Esau."

Again, one of the fundaments in educing a relation may be some item which was conscious shortly before and has at the moment of perceptual eduction sunk into subconsciousness. Thus, an after-dinner wine may taste, not only as pleasant in itself, but also as pleasanter than that which preceded. To the released prisoner, light may appear, not only as light, but also as being sweet in comparison to darkness. Experimental examples stud thickly the investigations of G. E. Müller, Martin, Whipple, Bühler, and many others.

Yet once more, the relations of higher order may include much of that which there is a recent tendency to designate as " censorship." In this way, a percept may be accompanied by an awareness of its being true, false, or imaginative. An image, or a notional presentation, may be recognized as being such. A picture may be apprehended—apparently from the " very first"—as faithful to nature, or as aesthetically meritorious. A face may be seen " instinctively" as kind or cruel, an action as noble or mean.

Further Evocation of Associates and Correlates. Turning, next, to the subsidiary perceptual operations of the other form, that is to say, those which consist in reproduction plus

correlate eduction, these too are of great variety and have many different levels.

A conspicuous instance is what we may term *anticipation*. This is just like the supplementation of the matchbox, except that now the items reached by way of supplementation have really been given already in direct sentience, but have not come to awareness, at any rate adequately. The great exemplar is reading. Here, as is well known, only a small portion of the visual word-form is cognized by means of sentiently based apprehension. For no sooner has such apprehension reached a sufficient—and surprisingly slight—degree of development, than there impatiently enters upon the scene the much speedier (but correspondingly more fallible) pseudo-perceptive process which has the same form as the supplementing of the matchbox. The following instance occurred to myself a few days ago. A big cinema advertisement in the streets depicted a man and a woman, each on horseback, jumping side by side over a high fence ; but whereas the man was clearing it in excellent style, the woman was being thrown out of her saddle. I seemed to see quite distinctly the title over the picture as "HE STOPS FIRM" ; but it turned out to be really "THE STOLL FILM."

This phenomenon is by no means confined to reading, however ; it is quite general. Thus at the present moment, I seem to see before me a uniformly yellow wall ; but more careful introspection shows that only a very small central area arrives at full cognition directly by virtue of sentience ; the colour of the remainder as sensed comes only enough to awareness to show that it does not differ from the central area very markedly ; and thereupon, by anticipation, the yellow seems to be present uniformly everywhere. Similarly, a clear glimpse of half a dozen leaves, together with a hazy vision of spotted green around them, suffice to excite the appearance of a whole expanse of foliage.

A still more curious, but yet kindred, phenomenon is when different items in the perceptual field modify each other

mutually. A particularly remarkable instance is that already quoted where brightness and even colour are not simply seen as actually sensed, but are interpreted in their relations to each other (p. 243). Even painters, whose art depends upon not succumbing to this illusion, more often evade than vanquish it ; the supervening transformation is not so much eliminated as compensated. Another very striking instance is that of visually apparent size and distance. Primarily, the size of an object appears proportional to the magnitude of its retinal image. But in the course of experi-

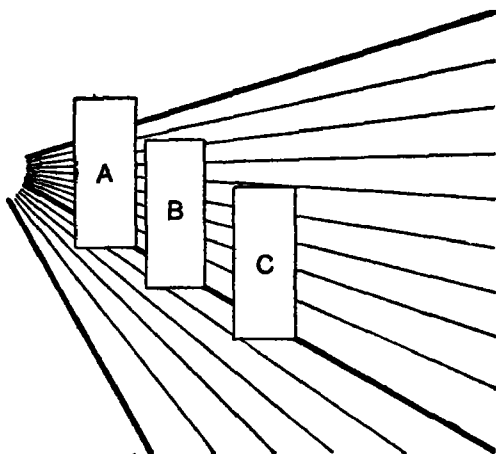


FIG. 19.

ence, the size of objects having the same retinal magnitude has been learnt to be the larger in proportion to the distance ; consequently, the more distant anything is taken to be, the larger it looks ; reversely, the larger it is taken to be, the nearer it looks. Thus, in the accompanying figure, *A* is primarily taken to be further off than *B*, and thereupon forthwith looks bigger ; similarly, *B* looks bigger than *C*. The case of sounds is analogous ; the greater apparent distance produces a greater apparent loudness ; whereas a greater apparent loudness produces a smaller apparent distance. In all such cases, we are obliged to infer the occurrence

of two successive and very different operations : primarily, there is a direct perception of all the items concerned ; and secondarily, modifying or ousting the former, various associates and correlates are evoked as in the case of the matchbox.¹

Simple Reproduction. So far, we have taken no account of perceptual reproduction save to the extent that it occurs in intimate union with correlate eduction. But it may also occur simply. Take as example a marine percept that evokes the notion of danger. Usually, this danger-notion will be more or less specially and newly adapted to the present particular percept, and therefore will not possibly be explicable as a mere reproduct. But at other times, no such new adaptation may happen ; instead, some previous notion of danger in reference to the sea may be revived without any change and by virtue of reproduction alone. Yet further, the present percept of the sea will tend to evoke, not only any previous danger-notions through reproduction by contiguity, but also representations of the previous seascapes themselves through reproduction by resemblance.

A point of particular importance about such reproducts by resemblance is that they may consist of concepts liable to be *confused with the characters reproducing them*. Thus, a line can by reproduction evoke the concept of straightness, and thereby in a way seem to be straight, although it is at the same time clearly perceived in a sentiently based manner to be more or less irregular. Such confusion between the reproducing purely perceptual and the reproduced conceptual characters may increase indefinitely, until at last the latter become worked into the very body of the former, like beads cunningly strung into a design of tapestry. At the limit, the perception can no longer be said to reproduce,

¹ Similar interaction would appear to occur at an even earlier stage in sensory cognition. Thus, two colours may be simply apprehended by virtue of the first principle. Next, by virtue of the second, an awareness may arise of their relation of difference. Finally, by virtue of the third, each colour plus the difference-relation can further clarify the other colour.

but only to be facilitated by, the previously presented concepts.

Such conceptual reproduction or facilitation can often be inferred from its after-effects. The following figure *A*, e.g. was exhibited to a person for about a quarter of a second. It was then drawn by him as *B*.¹

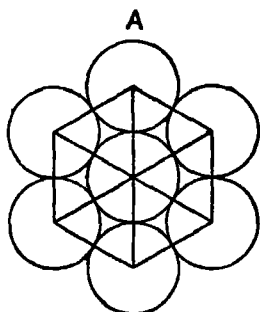


FIG. 20.

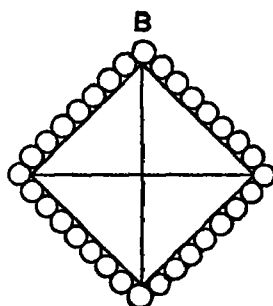


FIG. 21.

Evidently, the original percept must have reproduced such conceptual notions as might have been expressed in the words "many circles," "symmetrical arrangement," "framework of straight lines," etc., although their presence was unnoticed in the original operation of perceiving, being then swamped by the intensity and multitudinous detail of the percept as based on actual sentence. In *B*, however, the conceptual constituents alone survive. But still they do not simply reappear by virtue of reproduction; there is no reason to suppose that the original percept, or even the primary remembrance of it, really resembled *B*. In order to construct this latter, the concepts, although originally indeed simply reproduced, must then have had to be elaborated by a further very complex operation, wherein the largest share falls once more to correlate eduction.

- Such superior retention of the conceptual constituents of a percept, together with subsequent utilization of these constituents for the purpose of re-construction, is interest-

¹ Bartlett, *Brit. J. Psych.* viii. 1916.

ingly manifested in the drawings made by very young children, as, for instance, that given in figure C.

Indeed, without having recourse to examples culled either from experimental investigations or from the drawings of young children, even the normal percepts of adults show the same phenomenon, as instanced by Chinese perspective, by pre-photographic portrayals of galloping horses, or by the even yet customary conventional pictures of the human face.

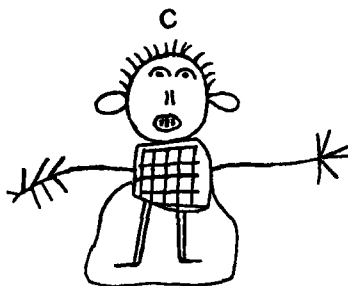


FIG. 22.

Gradualness of Transition. In all the above-mentioned kinds of subsidiary operations, whether relation-educing, or reproducing combined with correlate-educing, or simple reproducing, there is no abrupt break between the items which are apprehended as belonging to the perception itself and those which are clearly distinguished as following later; the transition is perfectly gradual. Usually, the dominant factor is the degree of facilitation by practice. As the repetitions increase, so too does the speed with which the items are reproduced, and so correspondingly does the distinction of them as coming later become more difficult.¹

Take the case of understanding a word spoken in an unfamiliar language. First to arrive in awareness is the sound, and afterwards, haltingly, the meaning. But in

¹ At the stage where the supplements are not distinguished as occurrences from the perception itself, they are sometimes called "tied," in contrast to the items which are reproduced more separately and therefore called "free." The importance of this distinction would appear to have been exaggerated.

proportion as the language becomes better known, the meaning follows more closely on the heels of the sound. With sufficient habituation, it begins to supervene on the sound before the latter itself has reached its full degree of clearness. Eventually, the meaning and the sound seem even on most careful introspection to arrive quite simultaneously. Yet a suitably arranged experiment will easily demonstrate their respective arrivals to be still separated by a finite interval, and will even measure its duration.

A similar gradual transition from originally complete distinctness to eventual fusion and apparently (but not really) simultaneous commencement befalls perceptual adjuncts of all sorts, on being sufficiently speeded up by repetition or otherwise. Thus the writer of these lines seems to have an immediate vision of a girl near him reading a book ; a gum-bottle in front of him seems from the first instant to contain a stuff that will make things cohere ; the electric bell at his side seems at once to be something to press ; when he turns to the window, the house opposite comes into his view seemingly straightway as the old familiar one he has seen there so often before. In fact, the trend and richness of such appended or " tied " notions of conduct, usage, history, and so forth, furnish by far the greater portion of the differences between the percepts of different individuals. What for one perceiver is only a little cloud becomes for another the harbinger of a dangerous storm. What to one is but an awareness of a " horse " presents itself to another as that of a " clumsy-shouldered, slack-loined, curby-hocked, aged gelding." What for one is no more than a " Kodak " develops for the perception of another into a " reflex, extension, swing-front, focal-plane, anastigmatic, hand-camera de luxe." In attaching such additional cognitive items, which gradually overtake and finally coalesce with the pure percepts, lies one of the largest endeavours of pedagogy. By industrious learning, the sight of dew becomes enriched into that of condensed aqueous vapour ; flowers into organs of phanerogamous reproduction ; poetry, into dithyrambic, Archilochian, and so forth.

MOVEMENT

Coordinate with the domain of perception—in some important respects, at any rate—is that of movement. And the mental operations involved in the latter, no less than in the former, urgently need analysis. But strange to say, highly as movement has often been valued by many psychologists—perhaps even too highly—still the serious analysis of it appears always to have met with regrettable neglect. Here, space can only be found for a most summary treatment of the matter. But even this much, it is hoped, will supply a foundation upon which the proper superstructure can subsequently be built up with comparative ease.

The most vital operation required for moving is to obtain a notion of the characters of the required movement (as place and direction). Such an operation would seem to fall into four fairly distinct classes. The first—small in range and importance—consists of those which can be effected in the most direct manner; the characters of the required movement are already given in the visual percept. An example would be to ink over any design previously sketched in pencil.

Somewhat more complex is the second class. The notion of the movement to be executed is not expressly given in the visual percept, but has instead to be obtained therefrom by exploring a certain field and selecting such places and directions as satisfy certain conditions. For example, a player at bowls might survey the whole alley and, whilst doing so, pick out the fittest direction in which to bowl. What is added here, as compared with the first class, is the *educing of manifold relations*.

Still more important is the third class, in which the notion of the requisite movement has to be obtained by way of *educing a correlate*; a bodily attitude and a relation (or system of relations) are given, and from these jointly the correlative movement has to be educed. To this class belong all drawing (other than the mere tracing already mentioned), whether the original to be copied is a material

thing, a picture, a design, a mental image, or even a notional presentation. Similar cases are those of carpentry, metal-working, etc. ; since here, too, each operation generally consists in moving according to some almost completely prescribed model, design, or concept. To this class belong also all such regular movements as those involved in ordinary walking or eating.

The fourth class, which is perhaps even more extensive still, involves *first a reproduction* and then a *correlate eduction*. It again occurs where a bodily attitude and a relation are given, but now these do not determine the nature of the requisite movement with even approximate completeness ; they leave, instead, a choice of alternatives. When, *e.g.*, a boxer sees a blow impending, he strives to escape it ; but he has a diversity of guards at his disposal ; or instead of adopting any of them, he may spring back ; or he may merely duck. To be included here is also the whole range of the so-called action " by trial and error," as when a person fumbles with an obstinate lock until at last some happy push or turn opens it. Now, the usual attribution of such movements of the fourth class to " chance " must here be emphatically rejected. Their adoption would appear, rather, always to have some mental cause susceptible of investigation. If, as is here assumed, this cause is neither a deliberate choice nor a blind reflex, then it can scarcely be other than some reproduced *rule* of moving (p. 102). But hereby, the operation shows itself to be at bottom, once more, the reproduction of a relation closely followed by the eduction of a correlate.

The four preceding classes refer, as mentioned, to the operation of bringing to awareness the characters of the movement to be effected. But there would appear to be needed, interestingly enough, still another operation before the conative *fiat* can be effectively issued. Our knowledge on this point is chiefly due to the investigations of Bair, Woodworth, and others.¹ In order to be able to contract a

¹ Bair, *Psych. Rev.* viii. 1901. Woodworth, *Studies in Phil. and Psych.* by former students of Carman, 1908.

muscle effectively by conation, it is not sufficient (as had been supposed previously) to have apprehended the experience of its contracting; there is need to have apprehended its being contracted *by means of conation*. From this fact (together with corroborative introspection), we must conclude that there is a special process required over and above the notion of the particular movement plus the notion of willing it; these two notions have to generate the further one which they jointly *constitute* (p. 114).

But whilst, as shown, it is almost always the principle of correlates by which movements are initiated, the other educative principle, that of relations, has the hardly less important function of checking whether the movement is being made rightly or wrongly. The need of such cooperation between the two becomes most conspicuous in those cases where the educing of relations, but not that of correlates, has been eliminated pathologically. This may occur from some injury to the kinaesthetic tracts of the spinal cord. The patient may be almost or quite unaware of the true position or movement of the affected limb; and yet (so long as the limb hangs naturally) he can still impart to it a movement of normal accuracy *if the distance to be traversed is only a few inches*.¹ As the distance becomes longer, the movement grows more and more inaccurate. Thus we see that the eduction of relations, although taking no part in helping the motor impulse to correspond originally with the patient's intention, still serves to indicate how faithfully the intention is being carried out. So soon as any deviation is thus reported, the movement undergoes—once more by way of correlate educing—a corrective re-direction.

One interesting and practically important corollary of this fact is that a man's motor dexterity depends upon different factors for quick and for slow work. In the latter of these, there is comparatively little need of efficient kinaesthetic sensations; for the accuracy of the spatial relations

¹ *Am. J. Physiol.* xliii. 1917.

involved in any movement can throughout be supervised by those of vision.

Cognitive. So far, we have taken the word movement to mean, as usual, that of the body. But it has sometimes been extended to cognition also, and thus taken to include any shifting of the focus of perception, or of thought, or any change whatever in the distribution of cognitive energy (p. 131). In this sense, it would comprise the mental "exploration" which we have frequently had to notice.

This extension of meaning, however, introduces no new difficulties. Almost all that has just been said about bodily movements applies to those of cognition equally well.

CHAPTER XVI

THE INTELLECT : CONCEPTION

THE "CON-"

Compositeness. Fixity. Verbality. Discreteness.

THREE TYPES.

Disintegration. Confusion "Free" Education.

FLUID AWARENESS.

THE "CON-"

FROM the preceding domain of Perception, admitted universally to be shared with the lower animals, let us now ascend to that of the Intellect, where man claims to reign alone. The traditional account traverses it in three stages : Conception, Judgment, and Reasoning. And this well-worn path may perhaps, for our purposes also, lead to the most convenient vantage-points of view.

Compositeness. As regards conception—to take this first—a much needed preliminary is to agree what the word shall be intended to mean. In the most widely current definitions of it, the characteristic chiefly emphasized is that of being *composite*. And a ground for this is obvious in the very structure of the word, since this suggests derivation from *capere* meaning "to grasp," and *con* meaning "together." Such compositeness, however, has been interpreted in two radically different ways ; by one of them, it is the connecting of several items into a unitary whole ;¹ by the other, it is the embracing of all individuals into a general class.² And neither of these ways seems able to include innumerable cases,

¹ This definition is the one given, for instance, in the admirable philosophical dictionary of Eisler.

² Something of this sort will be found in most of the ordinary dictionaries, as that of Murray—

from which, nevertheless, the title of concept cannot reasonably be withheld. Take for example the concept of existence; this certainly does not "combine several items"; nor is it necessarily, or even usually, apprehended as furnishing a class.¹

Fixity. In point of fact, the common basis of these two views, the taking of the "con-" to mean "together," would seem after all to be only an error of Latinity. This prefix merely bestowed upon the verb a certain intensification; the whole *concipio* might be translated by "I grasp, as it were, with both hands." But even so, there are still two alternative versions possible. According to the one, a concept is now defined as an item of awareness considered in respect of its essential character and without reference to any particular occurrence. According to the other, it is any apprehended character which has somehow become stably fixed in the usage of a person or a society; it thereby contrasts with sensory perception, which displays no such stability, but a never ceasing mutability. Each of these two interpretations of the word has much to say for itself. Here, we shall in general employ the *second* one, as being the more serviceable for our special purposes. A concept will be taken to mean any apprehended character (in the broadest sense of this word (see p. 66)) that has acquired stability of function.

To distinguish between these two, the absolute identity of essential character and the merely temporal stability of functioning, is a matter of no small moment. Imperfect discrimination between them may possibly have contributed in ancient days to Plato's exaltation of the intellectual ideas over sensory percepts on the ground of the former being immobile and changeless. And at the present day, it is perhaps partly responsible for Bergson's denunciation of this same intellect on the ground of such very immobility, which is now alleged to preclude it from comprehending

¹ There is no escape from this objection by urging that it at least engenders a class *potentially*. For the same might be said of any character whatever; "conception" would be so distorted from its legitimate meaning as to include even its antithesis, sensory perception.

whatever does change. In truth, the identity of essential character holds good, not only of ideas or concepts, but no less of sensory percepts also; any character, in whatever manner and however often mentally presented, remains always absolutely identical with itself. On the other hand, the merely temporal stability of functioning remains imperfect, not only in the case of percepts, but also in that of concepts. There is never really an absence, but only a slowness, of change. Even the most stable of ideas resemble a glacier, which, seemingly hard and motionless, really all the time flows river-like onward.

Verbality. Such stability as does occur would appear to derive almost wholly from the fact of concepts being expressed and employed in conventionally accepted *language* (especially written). They thus become like molten bullion poured into coining moulds, whence—after due rolling, punching, and pressing—they issue as legal tender for general circulation. When the teacher faces new pupils, his first task is to estimate the number, nature, clearness, and truthfulness of all such indurated and communicable concepts at their disposal. Upon these he has to base all his instruction. He may even, not unwisely, institute an experimental survey of them, utilizing the methods evolved by Hartmann, Whipple, and many others.

Discreteness. This verbally attained fixity, most advantageous in itself, has had to be purchased at a heavy price. For it entails, and in its effects is intimately blended with, the further character of discreteness. By this is meant that the concepts nowhere cover the field of cognition continuously, but only mark out certain points in it more or less widely separated from each other.

A contrast may be drawn in such respect between conception and perception, taking as instance the comparatively simple case of visual quality. As regards a percept, on the one hand, this can easily fall anywhere throughout the whole continuum from greatest brightness to greatest darkness, or from extreme red to extreme violet, or from any one size,

shape, and duration to any other. Between no two varieties does there exist any inaccessible interval, however microscopic. Quite otherwise, on the other hand, is the range of visual quality as rendered in concepts. So rendered, it is expressed by single words or set phrases that have very large intervals between them. When a person ceases to conceive a colour as "blue," he usually jumps straightway to "green"; and thence again, to "yellow."

Especially instructive examples of this discreteness may be gathered from observations of child-growth. An instance noted by the present writer was that of a boy about two years old gradually learning which of the things around him were painfully hot. One day he suddenly, with a beaming smile, showed himself to understand that such heat is signified by the word "burn." From that time forth—although not without occasional lapses into error—all experiences of touchable articles, such as puddings, kettles, bathwater and so on, seemed to fall for him into two distinct categories, those that did, and those that did not, "burn"; his conception admitted, apparently, of nothing intermediate. Of such disjointed verbal concepts a man amasses in due course from about a thousand up to a hundred times as many, according to his ability and culture. Although conception may be said to possess no brush or palette, but only a box of mosaic stones, still this holds more varieties than were imagined even by a Territi or a Giotto.

These discrete concept-names, which originally have been acquired by a person for the special purpose of communication, soon extend their influence over his whole purview of cognition. With some one of them he seeks to fit every object or situation that presents itself. They serve him as mental havens. In thinking he flits from one to another as children do from post to post in the game of touchwood. If he remains savage, he may regard them as magical spells. Should he climb the pinnacle of civilization, then—with the Pythagoreans, the Alexandrians, and their modern congeners—he may outright worship them.

THREE TYPES

Now, after settling what kind of mental phenomenon the term "concept" shall signify—and our choice is to take it as any item of cognitive content that by verbalization has become comparatively stable—the path lies open to consider the origin and nature of such items.

Disintegration. Observation easily shows that at least some of them are continually and from a very early age developed by what may be called a process of disintegration, especially out of percepts.

Disintegrated and fragmentary, indeed, is the cognitive intercourse of the individual mind with the universe from the very outset. Examine, for contrast, the completeness of the intercourse of the material body with this universe in so far as the latter, too, is material. Not an electron can quiver in the remotest corner of the Milky Way, nor even in the boundless space beyond, but that each part and particle of every man's bodily tissue quivers in exact response. Consciousness, far otherwise, possesses no primary avenue to the outside world save by way of the receptive sensory organs and the neural conductors; and these only respond in their manner to such stimuli as happen to impinge upon them; and then only if these are of peculiar kinds and lie within narrow limits of intensity. Moreover, even of this slender current of information, the mind is only able to utilize fully a small fraction. In the case of sight, for instance, minute as is the retinal area which alone gives access to vision, and still more minute as is the fovea which alone can invest the vision with clearness, not a hundredth part even of this fovea can subserve clear vision at any one and the same moment. If in any such part the clearness be raised to its maximum, then all the remainder lapses into comparative obscurity.

Even at this stage, however, cognition has not nearly arrived at its extreme limits of disintegrability. By the very fact of being concentrated upon such small concrete

objects, it all the more effectively cleaves these along another plane, that of "abstraction," as it is called.

An instance fresh in the memory of the present writer, and one where already the verbal symbolization supervenes, is from the boy just mentioned. He had been told that one can of water was "hot" and another one "cold." Soon afterwards, he was noticed sitting on the ground with the cans in front of him, and putting his forefinger—in babyish iteration—on each alternately, accompanying the respective movements by the words "ho" (hot), and "co" (cold). Two days later, he suddenly at dinner began to point at, but not touch, a steaming pie and a jug of cold water, again uttering his little chant, "ho," "co," "ho," "co."

Under analogous (though not often so favourable) conditions, children learn that certain things are "good" or "bad," "sweet" or "sour," "round" or "square," "pleased" or "angry." In the beginning, the process may still be called perceptual; but soon—as is proved by increasingly dexterous manipulation of adjectives as such—the child becomes able to think of the characters more and more separately from the objects which they characterize. In this way, the field of cognition, already cut up into concrete sections perceptually, is now split into abstract layers conceptually; among them are those of quality, quantity, space, time, and even bare existence.

As for the mechanism by which all this disintegration is accomplished, there would appear to be two wholly different and successive changes involved. The first merely derives from the fact that perception (like all other cognition) grows by way of increasing determinateness (p. 159), and therefore offers increasing scope for differentiation; items in the cognitive field become more and more distinctly "hot," "cold," etc., simply by virtue of the three noegenetic principles. The second change is of a more mechanical nature and may be called a disruption; it is the separating that occurs in respect of actual occurrence. Here, the explanation must be obtained from the quantitative principles; it comes

especially from those of mental energy (p. 131) and of retentivity (p. 132). Some item in the perceptual field, such as the character of being "hot," absorbs the chief share of this energy, whilst the remaining items are proportionately faint. Such a dominant item naturally leaves behind it a far stronger disposition to revive subsequently than the faint items do. And if, as is likely, the dominant and the faint items are not perceived in any close or repeated relation to each other, the two do not become firmly associated together (p. 146). The consequence must be that the item which was dominant may upon a later occasion be reproduced *without* any of the items which were faint; the "hot" comes to mind no longer accompanied by "bright," "round," and so forth. In this manner, the cognitive field becomes disrupted by inequality of disposition together with weakness of association, much after the fashion that heated glass is cracked by uneven expansion together with low tenacity.

Confusion. Over and above all such disintegration, however, there is another way of forming concepts, which seems to have been particularly responsible for the defining of this as an embracing of individuals into a general class. This second way seems no less than the first to have been commonly included in the theory, that conception consists in a "rolling out" of any object frequently presented with varying concomitants. But it lies more particularly at the basis of the kindred view, that would liken conceiving to composite photography and accordingly would regard the concept as being some sort of *average* of previous cognitions that partially resembled each other.

In order to examine this type of concept scientifically, recourse must be had to experimental investigation; and we will turn once more to the work of Aveling.¹ This was based on the successive exhibition of several pictures. The latter fell into series, in each of which all the pictures represented an object of the same general kind, but greatly

¹ As the work was conducted in our own laboratory, I was myself, naturally, in intimate connection with it from beginning to end, and must thankfully acknowledge no small debt to it.

diversified in detail. Thus in one series, every picture was of some little boy in rapid movement, as running, jumping, and so on ; another series depicted a variety of conic sections ; another one, receptacles for liquids ; another, a general type of birds, another, torsos of children. Under all the pictures of one and the same series was written one and the same specially coined and otherwise meaningless word. Subsequently, this word was shown to the person and was suffered by him to reproduce what it would.

The resulting reproduct for each series was indubitably some sort of residuum of the pictures, this residuum being presented in intimate connection with the name ; it therefore already constituted a rudimentary concept. Now, there is no difficulty in analyzing the operation by which this residuum of the pictures thus becomes detached from the remainder of the originally concomitant field of cognition, such as the sights of other things in the room besides the pictures, as also the various accompanying sounds, tactual impressions, thoughts, emotions, and so forth. For all this is simply an instance of the disruptive procedure which was analyzed before ; it is, then, at once traceable to the quantitative principles of mental energy and of retentivity (p. 131).

The really specific character of this kind of concept, however, plainly does not lie in the connection between the pictures and their previous concomitants, but in that between two portions of the pictures themselves, namely, the constant common feature and the varying particularities. Now, the current tendency is to assume that here also a disruption occurs, in that the residuum of the pictures necessarily consists of the common feature alone, and that the varying particularities eventually vanish. But against this must be said that the two chief reasons just given for the disruption are no longer present. For though the common feature has, indeed, the advantage of many repetitions ; yet it does *not*—what is much more important—attract the great bulk of the mental energy. And it *does* enter into closest possible relation to the particularities.

Refraining, then, from the current facile assumption that the residuum consists simply in the common feature, and instead submitting this residuum to a careful, unbiassed examination, a part of it shows itself to consist in "images"; and these, at any rate, are by no means any common constituent, but rather fragments of one or more of the pictured objects with all their particular variations; nor are they characterized by any fixity, but rather the reverse. The other part of the residuum consists of a purely insentient or notional awareness. This does tend, indeed, to become more and more fixed. But still even this cannot truly be said to consist in the common feature alone. Take, for example, the series which depicted small boys running, jumping, etc. Here, the movements were of widely different sorts. They were being executed in altogether different directions; they were caught at quite different phases; the boys themselves differed in face, figure, clothes, and in every other feasible detail. Out of all this, there certainly did not issue in solitariness the boyhood, the smallness, and the lively motion, as required by the "roll-out" theory. Nor was the result any such an absurdity as the "average" movement, etc., required by the extreme theory of composition photography. In truth, the imageless residuum, according to the observations of the present writer, instead of being only the feature common to every picture, was in some sort a temporary *confusion* of the entire different pictures including (though more faintly) their differing characters. And this confusion is readily explicable; the effect of the simultaneous reproduction of multiple partially similar objects is that these are at the moment in some degree not distinguished from each other; hereby the collective cognition regresses for a time towards the state of indeterminateness from which it always originates, and to which it readily lapses back again (see p. 155).

This confusion, however, is not usually complete, even momentarily. Already whilst the pictures are being exhibited, the later ones of a series are often recognized as

similar to many earlier ones. And on the final exhibition of the name alone, such multiplicity of similars often comes again to some degree of awareness. Moreover, many other relations are eventually cognized between the various pictured objects, such as the nature of the differences, the order of succession, the appertenance to the same series, and so forth, in ever-increasing variety and organization. After this fashion, these residua, "recepts," as Romanes called them (perhaps "confunds" would be more suitable), do become invested with an increasingly prominent notion of constituting a general class; to this special type of concept, then, the current definition fits fairly well.

All these main points in the experimental results appear to be readily and unconstrainedly applicable also to the events of ordinary life. A relevant instance observed by the present writer was a child of two years (the same as mentioned before) clamouring for a "sweetie" (he could not as yet pronounce the word better than something like "eeya"). Thereby, apparently, he did not mean a particular sweetmeat, but *any* one. The origin of his concept was obviously from very numerous sensory percepts which, although approximating to a general type, nevertheless had large particular diversities, such as those which distinguish chocolate from peppermint, cream candy from Turkish delight, pineapple fondants from almond paste. But no "average" can reasonably be supposed to have been struck by him between things of such disparate quality. Nor can his concept be reasonably taken to have included just what is common to these diverse things; his expectation cannot well have been limited to bare sweetness. The difficulty is not even to be evaded by taking the concept to have consisted in the different qualities all mixed up together; no normal person, on being promised a sweetmeat, really expects—or even desires—such a mixture. Far more reasonably, the child may be taken to have behaved as in the experimental procedure and to have had a more or less *indeterminate*, and in this sense confused, notion of a sweetmeat at the moment.

Concepts of this residual kind, no less than the kind due to disintegration, evidently have a fore-stage in wordless remembrance, and even in perception. The child's notion of the sweetmeat could readily be traced back to what he must have had in mind—without as yet being named by him—when at a still earlier age he shouted and danced and clapped his hands on being shown the outside of a sweet-box. Perception is not blindly impartial, but intensely selective. Its scope, being narrowly restricted by the quantitative principle of mental energy, is guided by the further quantitative principles of conation, retentivity, and primordial potency (Ch. IX.) into particular directions ; these, naturally enough, accord more or less closely with the lines of constant biological needs. In this way, perception tends to concentrate on a limited number of objects, each possessing, throughout all the particular diversities, some common nucleus. Examples are the infant's percepts of his mother, of his feeding bottle, or of his rattle. Later on, he may acquire similarly selective percepts of his father, of his brothers, sisters, and playmates ; of balls, boots, chairs, tables, beds, dogs, cats, trees, houses, sun, moon, rain, and so forth in great and rapidly increasing multitude. Each of these in time becomes conceptualized in a manner basally resembling the confusion which occurred in Aveling's experiments. The number continues to augment swiftly. When about six years old, the child can freely think and talk about such things as books, money, umbrellas, doors, windows, fire-places, bread, meat, potatoes, carriages, trains, wheelbarrows, shops, churches, theatres, gardens, fields, woods, hills, valleys, horses, sheep, flies, bees, soldiers, policemen, doctors, clergymen, cooks, nurses, girls, boys, grandmothers, and grandfathers.

"Free" Education. There remains, finally, a third type of concept. Whereas the two former were obtained by means, either of disintegrating, or else of confusing, items cognized already, this third kind is characterized by being able to generate really *new* mental content. The sole

processes possibly capable of such generating are—by the cardinal doctrine of the present work—those of noegenesis, including especially for present purposes the eduction of relations or correlates. For such educts to become attachable to names and thus conceptualized, the sole condition needful is that they should arise, not as “tied,” but as “free” (p. 256); that is to say, they must, whether by slowness of rising or otherwise, be presented more or less distinguishably from their educing items.

Pre-eminent instances are the chief concepts of the sciences. Thus, mathematics evolves, by laborious eductions one after another, such concepts as those of “number,” “contiguity,” “infinity,” “function,” “exponential,” “series,” or “aggregate.” Similarly, physics has produced its “molecules,” “atoms,” “electrons,” “ether,” together with its “potential,” and “actual forces.” Biology has brought forth, in particular, its “evolution.” And so on with the other sciences. Here must be reckoned, too, the concept of “God,” whose origin furnished occasion for the great ontological controversy started by Anselm, to some extent disentangled by Descartes, and perhaps re-entangled by Kant.

Of all such scientific creations, a large portion springs obviously from correlate eduction. An instance of especial importance, both historically and philosophically, is the keenly disputed concept of the “infinite.” From our present standpoint, this may readily be seen to consist in “that which bears to finite the relation of oppositeness.” Similarly, the concept of “God” (or at least one version of it) is “that which bears to the cosmos the relation of adequate ground.” In this last instance, indeed, the correlate can only be found very imperfectly. But the same may be said of many other cases; consider, for instance, the mathematical concept of “exponential” as “that which bears to an any-valued exponent the same relation as a number multiplied by itself with a given frequency bears to this frequency”; here, too, full realization of the correlate indicated becomes

impossible for human beings (though only, it would seem, on account of the quantitative principle of primordial potency, p. 136).

Another large part of these educed concepts approximate to those which have been regarded by the two opposing Austrian schools as "complex-qualities" (Krueger) or as "productions" (Meinong), but which according to our view are attained by correlate eduction of the constitutive kind (Ch. VIII.). They consist in elaborate systems of relations, often taken conjointly with their fundaments. Thus, the concept of "series" is constituted of the serial terms together with their serial relations; "evolution," of successive states together with the relation of continuous change to greater complexity.

Although the three preceding ways of obtaining a concept—by disintegration, confusion, and free eduction—are in themselves so many distinct operations, nevertheless two, or even all three, can quite well be applied to the same concept at different stages of its development. First of all must necessarily come, *not* the confusive procedure, but some degree of disintegration. For example, before ever a diversity of tree-percepts can combine into an indeterminate tree-in-general, the single trees must be at least distinguished from their surroundings. But still the confusive procedure, although thus second in starting, yet usually arrives first at the more advanced stage of earning a name. Subsequently the balance may swing back and the concept receive further finish from a disintegration again. And finally, the eduction of a correlate very often supervenes; to this last source, all *definition* admits of being reduced. Thus, when a tree comes to be defined as "a plant with an erect trunk and spreading branches both of which are woody and perennial," the meaning of each of these words is a product of disintegration, whilst their collective meaning is evoked as a correlate (of constitutive sort, see Ch. VIII.).

The child's activity in creating and improving his concepts

is chiefly impelled by failure of his existing stock to suffice for the needs of ordinary life. In an instance recently observed by myself, a girl of about five years, meeting a foreign officer in uniform, could not make any of her concepts fit him even tolerably, and was forced in her puzzlement to inquire whether he was "A king or a clergyman." The concept of "foreign officer" was then built up by her, not through confusion as with Aveling's pictures, but rather in the same way as a triangle out of a figure possessing three sides (constitutive correlate educing).

In consequence of such difficulties, the child soon is no longer satisfied with learning names when told to do so, or when having actual need of them, but takes the initiative of trying to master any that he may hear used by other persons. As early as his fifth or sixth year, he keeps asking, "What is an 'uncle'?—A 'soldier.'—A 'thousand.'—To 'die'?"

When the age of schooling arrives, the embarrassments of ordinary life are to a large extent preventatively anticipated by those which the teacher imposes. This, so to speak, prophylactic treatment may be carried out with all the rigour of the seven Herbartian steps. And the concepts submitted to treatment usually become increasingly abstract. Eventually, a person may, with Socrates and Plato, overhaul his whole ethical armoury, seeking for satisfactory concepts of "goodness," "justice," "beauty," "love," "courage," or "temperance."

FLUID AWARENESS

Throughout this chapter up to the present point, the concepts have always been contrasted with sensory percepts. Currently, there would appear to exist an endeavour to go much further in this direction, and to regard these two as complete complements to one another, so that together they supply the whole cognitive content. In this way, the term conceptual is taken to be coextensive with non-perceptual or ideational awareness. Such a view, however, would appear

to be misleading. Concepts in any of the definitions that we have mentioned, or that could reasonably be suggested, and even including all the notions that although possessing names are temporarily presented without them, are still wide indeed from being the sole stuff of which non-perceptual awareness is composed.

The most striking examples of further awareness is supplied by those thoughts which, far from consisting in any arrangement of concepts fixed by names, show themselves unable to find expression in language at all. Of this nature is perhaps the bulk of the "imageless thought" or "sciousness" (Ch. XII.).

But even when a thought does or can find fitting expression in words, still the collective meaning is so unlike being simply the sum of the single or conceptual meanings, that the passage across from either to the other requires, as we have seen (p. 117 ff.), a separate cognitive operation—which can even upon occasion present formidable difficulty.

The cognitive field may, then, be compared to an ocean studded with icebergs. Over much the larger portion, including not only sensation, but most thinking also, it is still fluid. Only here and there, has the thought frozen into verbo-conceptual rigidity.

CHAPTER XVII

THE INTELLECT : JUDGMENT

NATURE OF "JUDGMENT."

Relations between Concepts. Cosmic Validity. Subconsciousness.
Alleged Ultimate Logical Principle.

FORMS OVERLOOKED.

Semi-perceptual Cognition. Fluid Fundaments. Eduction of Correlates.

OPINION.

Habit. Authority. Error.

NATURE OF "JUDGMENT"

HERE, we arrive at what is both traditionally and currently pronounced to be the second great stage in the development of the Intellect, namely, "intellectual judgment." By such an operation, it is said, the concepts are joined to one another, and so produce rational knowledge.

Relations between Concepts. Now, as we have already seen (Ch. VI.), the common view of the elementary structure of "judgment," intellectual or otherwise, is open to much criticism. Such a view confounds the basal process of producing knowledge with two that are only subsidiary. The one is anterior, and consists in a preparatory distribution of the mental energy. The other is posterior, and consists in a volitional adoption of the knowledge for practical purposes. This "judgment" has, further, been radically disfigured by being forced into the old formula, "*S is P.*" Worst of all, perhaps, the primary process of immediate knowing has been identified with two very different events, knowing with insight gained by mediatory processes, and believing without any insight at all.

Stripped of these dispensable subsidiary processes, cured of this disfiguring formula, and purged of these mistaken identifications, the "intellectual judgment" eventually reduces itself to neither more nor less than a particular case of educing relations; it is that case where the fundamentals of the relation consist in concepts.

Cosmic Validity. The next matter for consideration is the venerable doctrine, that intellectual judgment has the virtue of universality, in the sense of not restricting its scope to any particular thing or event, but embracing the whole class throughout the cosmos.

Now, the fact that cognition can thus reveal truth transcending all experience, past, present, and even to come, is not—by the writer of these pages, at any rate—for a moment denied. Nor need we even dissent from those great thinkers, ancient and modern, who have believed that just this transcendent power proffers the farthest reaching clue to the psyche's inward character and ultimate destiny; perhaps, indeed, to the character and destiny of the cosmos itself. The numerous writers who oppose such transcendence as being absolutely impossible could not so much as attempt to make good their contention save by themselves using arguments that transcend experience.

With all this cognitive power freely conceded, however, there still remains the task of ascertaining precisely where and how it comes into function. And on this point, we must venture to oppose the ancient doctrine referred to, by asserting that, in general, the power does not arrive *in*, but *after*, the eduction of relations between concepts. Take as a definite example the cognizing that "the whole is greater than the part." Here, insight only reveals—to begin with—that the whole is by its essential character greater than the part (p. 77). In order to attain to the knowledge of cosmic validity, there is need of an additional proposition (avowed or implied), namely, that whatever holds good of anything by its essential character must hold good of it throughout all the existing cosmos. This further proposition, thus

introducing the relation of evidence together with the notions of "all" and of "existence," is not only additional, but in point of fact would appear to be actually cognized rather seldom. And such a rareness certainly cannot be attributed to any want of familiarity with the concept either of "existence" or of "allness"; for even the latter is common enough in other references from at any rate a child's fourth year onwards. Thus, Stern records that his daughter at three years and eight months said,

"What I call roast-meat, mother does too, *all* people do."

Half a year later, she even asks,

"And who was the original grandmother of *all* mothers?"¹

It may be remarked that here, as usual, the issues involved are by no means so exclusively theoretical as they might seem to be. If the doctrine that intellectual judgment is characterised by universality were to be accepted, then, in the light of the last paragraph, all tests of intellectual power (other than conception and reasoning) would have to be reduced to tests of insight into this single proposition, namely, that what holds good by essential character does so universally.

Subconsciousness. Not only are conceptual propositions which explicitly refer to the cosmos remarkably rare, but even conceptual propositions in general apart from such reference seem, on first actually looking for them, to be of unexpected scarcity. And this is the case, not only among children, but even among adults. The nearest approach to them among children comes as a rule in sayings with a didactic tendency, as "To fall down is stupid"; "naughty children ought to be punished"; "play like this is silly." Their chief eventual home is supplied by the deductive sciences, as: in logic, "*S* cannot be *P* and not-*P*"; in geometry, "The whole is greater than its part"; in physics,

¹ *Die Kindersprache*, 1907, pp. 219-220.

"Any change of either the direction or the speed of a body's movement proves that it is acted upon by some force." But on the whole, propositions whose fundamentals are explicitly and manifestly concepts continue throughout life to occur comparatively seldom.

A change, however, seems to take place in this respect on descending to the region of faintly detectible consciousness, and still more so on penetrating to that of only inferrible subconsciousness. Here, such eductions of relations between concepts do perhaps attain to great frequency, whatever the age of the person, the purpose of the utterance, or the topic under treatment. The form which they here seem to assume is in a large proportion of cases that of the major premise to a syllogism. When, for instance, a person says, "I shall not be able to water the garden to-morrow, for I shall be away," he has at least the appearance¹ of being guided by some sort of insightful awareness, that being in one place is incompatible with watering in another. Analogous is the following utterance of a boy only two years old (his very first of more than three words): "Me clever boy, pull sleeve down." For the point of this remark seems to be that to pull down a sleeve shows a boy to be clever.

Alleged Ultimate Logical Principles. One more point about this eduction of relations between concepts requires notice. So far, we have been taking this to be possible in an indefinitely large number of cases. But there is a prevalent doctrine which maintains that all of these cases, in so far as they involve cosmical validity, are reducible to a very small number. Some authorities would take them to be supplied by a set of axioms. Others would restrict them to three alleged basal "laws of thought": that of Identity, "Whatever is, is"; that of Contradiction, "It is impossible for the same thing to be and not to be"; and that of Excluded Middle, "Anything must either be or not be." According to yet another and perhaps the commonest view, only one of these three—most often taken to be that of contradiction

¹ For an explanation of our hesitant tone here, see note 1, p. 299.

—is asserted to be genuinely primordial, the other two being derived from it.

Now, to the present writer, this alleged reduction would appear to be quite invalid. Consider, for example, the last mentioned and commonest form of it, that which would bring every cosmic proof under the single proposition, "S cannot be *P* and not-*P*." All that its advocates have really ever done is to show that the awareness of relations between concepts *can*, in addition to being attained by direct intuition, be also reached by some chain of argument which contains this law of contradiction as one of its links. The reduction has, then, no deeper significance than that by which every theorem in mathematics can, if desired, be put into the form of a *reductio ad absurdum*, a form which mathematicians rightly seek to avoid, as being of inferior quality. The doctrine is as if a man should say that since he is at liberty to pass through London on his way from any place on the earth to any other, therefore all earthly journeys consist at bottom in crossing London. Just as cosmically valid as the law of contradiction are, to take a few striking examples, the following: in geometry, that two straight lines cannot enclose a (Euclidian) space; in respect of time, that the past cannot return; in algebra, that $ab = ba$; in physics, that nothing can be generated out of nothing; in psychology, that no conation can occur without cognition; or in ethics, that a person ought to do what he believes to be right. Material for cosmically valid propositions is, in fact, furnished by every genuine eduction of relations between concepts.

FORMS OVERLOOKED

Up to the present, our consideration has been solely of "intellectual judgments," taking these in the sense of educing relations between concepts. But the question now arises, as to whether this kind of educing really fills up the *whole* domain of cognition that intervenes between, on the one hand, conceiving, and on the other, reasoning. In answer,

we must maintain that it is altogether inadequate for such a purpose.

Semi-perceptual Cognition. To begin with, account must also be taken of those cases—perhaps the most frequent of all—in which only *one* of the fundamentals is a concept, the other being still a percept, either actual, remembered, or imaginary. A child achieves such semi-perceptual eduction of relations, especially of the kind involving the relation of identity and usually called "subsumptive," before he can speak properly. They are suggested to him by his parents pointing out familiar objects whilst uttering their provisional childish names, such as "wow-wow" (dog), "chi-chi" (chicken), "lo" (locomotive). And he soon seizes every opportunity of making such subsumptions for himself, reporting them back with obvious pride to his parents; for upon occasion his one-word sentence "lo" may be manifestly intended to say: "That thing over yonder is such as is called 'lo.'"

When once an object perceived admits thus of subsumption under a concept, so also does the same object when only remembered. An instance may be quoted from this boy again: seeing an aeroplane, he made no comment at the time, but several minutes afterwards began to talk about it as the "birdie." In this manner, observation easily passes over into description and narration. Most often, the subsuming concept is based upon, or even constituted by, some system of relations; and these may be of great variety, such as logical, physical, psychical, aesthetic, or ethical. Curiously enough, few cases are of earlier date than those where the concepts are ethical. The boy just mentioned could already declare with great—even passionate—emphasis, that his sister, or his mother, was "nau" (naughty).

A little later, the child begins to connect his percepts (either in the identical or any other relation) no longer exclusively with a single concept, but now with the collective meaning of several. He announces the presence of a "red flower," a "large spot of dirt," or a "cracked window pane."

And even after his sentences have acquired considerable complexity their form may remain at bottom the same, inasmuch as only one of the fundamentals is a concept in the sense of a character; the other, even though indicated by a character, is not one itself. An example is the following remark of a child six years old: "Baby fell down, I only pushed him, and we are friends again, you are laughing at me." Here, the purport of the remark would not be in the least affected if "baby" were replaced by "he."

In adult life, the greater portion of almost all intercourse, serious or trivial, consists in propositions where one of the fundamentals is either a percept, or at any rate something indicated by a conceptual character rather than such a character itself. This may be exemplified by the following statements taken at random from the newspapers: "the present weather is extraordinary."; "he gave himself up to the drug habit"; "Holland continues to be in a state of grave unrest"; "our reputation as money-lenders speaks for itself."

"Fluid" Fundamentals. The next omission in the view here criticized, namely, that the intellectual stage between conceiving and reasoning is completely filled by the inter-relating of the concepts, derives from the restricted range of what the heading of concepts can properly include. For, as we saw in the preceding chapter, even the broadest usually admitted senses of the word would still fail to comprise that great ocean of "fluid" awareness in which the concepts are but as sparsely scattered islets.

Consider, for example, even literary compositions, where, if anywhere, verbally fixed concepts might plausibly be expected to be dominant. Suppose a person to be looking over some important and delicate letter that he has just written. Here, a censorship has to be held as to the due equivalence between the collective meaning of every sentence and the corresponding portion of the original thought; that is to say, between these two there has to be cognized a relation of identity. But it is hard to concede that either

of these two fundaments (the collective meaning of a sentence, or the corresponding portion of the original thought) can legitimately be called a concept, or even a sum of concepts.¹ Once more, then, a very widespread process is overlooked by the traditional theory.

Moreover, multitudinous relations have to be cognized, not only between the collective meaning and the original thought, but also between different parts of either of these. For instance, in reviewing the aforesaid letter, the question as to the cogency of some "because" might lead to a reconsideration of the logical dependence between the two clauses concerned. A similar result might ensue from criticizing any other word, even a mere "and." Equally well any items not actually stated, but only suggested, may lead to analogous operations. And the same can occur when dealing not so much with the material signification of a composition as with its literary form, its perspicuity, simplicity, brevity, impressiveness, or euphony. In the majority of almost all such cases, the fundaments to be inter-related are of the fluid rather than the conceptual kind. All these too, then, would be overlooked by the view here criticized.

Eduction of Correlates. Not even yet, however, have we brought into reckoning the whole gap that has need of being filled up between conceiving on the one hand and reasoning on the other. For all the operations which have been regarded in this chapter hitherto have been throughout confined to the eduction of relations. This omits the no less vital eduction of correlates. If the former—to return to our previous example—plays the leading part in reviewing a literary product, the latter does so in originally producing it. Correlate educing regulates the creation of all coherent writing, speech, and even thought, whether verbal or wordless. No less does it govern the operation of understanding the language used by others (see Ch. VIII.).

Should any further argument be needed to demonstrate

¹ As to the precise nature of the collective meaning of sentences, see pp. 117 ff.

its intellectual status, such is supplied by mental tests. For these everywhere reveal the educing of correlates to be at least as significant as that of relations in order to diagnose anything at all plausibly called "general intelligence."

OPINION

So far in this chapter, we have only dealt with those propositions (or rather thoughts in propositional form) where the belief rests upon adequate grounds and is, in general at least, accompanied by insight (p. 55). Those cases have been left untouched where belief occurs but is devoid of adequate grounds, so that instead of any genuine knowing there is merely an opinion or *δόξα*. Yet these cases, too, are commonly included under the name of judgment; indeed, with Locke they alone were so designated; they too require, therefore, some consideration here.

Habit. One large division of them has its source in the fact that, although the proposition may really have been cognized upon adequate grounds at first, yet later on it may carry belief by sheer force of habit. Insight has died away. Adequate grounds, even if still present in the cognitive field, are not actually effective in producing the belief. The latter now occurs, not by virtue of any of the noegenetic principles, but solely owing to the principle of retentivity.

Authority. Another conspicuous division of these blind judgments consists of those which even at the time of their first occurrence are not accepted through direct insight, but instead by authority. Without much exaggeration, it might be maintained that improvement in the range and quality of propositions accepted through authority is the sole basal advance of the human race for many thousands of years. By fortune of birth, the psyche enters into its great heritage of propositions which pass under the name of "common sense" and which consist for the most part in an immense store of traditionally bequeathed, but not demonstrated, facts, rules, maxims, adages, proverbs, precepts, and so forth. And when by the supervening agency of science,

these have been explicated, corrected, and enriched into laws, formulae, theorems, doctrines, axioms, aphorisms, or apophthegms, they still win belief much less by direct insight than by deference to authority.

Whenever this deference has a rational basis, the propositions being believed because of being affirmed by persons known to be worthy of trust, then the operation is still insightful, indeed, but of an inferential nature (see next ch.). Even in the absence of such a conviction of trustworthiness, however, the belief can continue to arise, being now no longer insightful in any way, but due to what is commonly called suggestion. As to how this latter phenomenon should be explained, psychologists differ. But perhaps it may best be ascribed to the fact that every person hears a limitless number of statements which are at once followed by genuine evidence ; from his very first year of life, a child's guardians are continually telling him that something is present and then showing it to him, or promising to do something and then doing it. In this manner, belief becomes reproducible (without insight) by means of association alone ; the person acquires a quite general tendency to believe statements made to him. Viewed on these lines, opinion is here again traceable mainly to the principle of retentivity.

Error. Such belief, however, arising from the quantitative instead of from the noegenetic principles, is a weapon with two edges. Immensely serviceable in economizing the expenditure of mental energy, it on the other hand would appear to be at bottom solely responsible for all human liability to *error*. Here, we come upon a topic so formidable, that any attempt to treat it in the summary manner alone feasible in this place, might seem almost impertinent. Yet to ignore it would be still worse. In a few words, then, we shall try to indicate quite broadly how the topic of error is viewed from the standpoint now reached by us. And for this purpose, it will be more conveniently handled, not with special reference to the operations of the intellect, but in a perfectly general manner.

Error can be regarded as possessing two extreme types, which may be called those of obscurity and of illusion. In either type, some bias acts as a substitute for insight. But in the case of obscurity, the substitution is due to feebleness of the insight ; whilst in the case of illusion, it comes from violence of the bias.

A familiar instance of the first type is supplied by the school-boy who has omitted to learn his lesson. When constrained in class to utter judgments, he is himself well aware of the insecurity of their foundation. To the same type belong most of the errors arising from what is commonly termed defective intelligence ; these, too, are not due to any overpowering mental bias, but rather to a mental blankness that leaves the issue at the mercy of any chance bias however weak. To this type may be reckoned also, in general, what is technically called in experimental work the "variable error."

To the second type, on the other hand, must be assigned the "constant" error. Let a person take up in his hand successively two boxes of equal weight, but very unequal size ; he will regularly pronounce the smaller one to be the heavier, not with the diffidence of the cited schoolboy, but with firm conviction. Clever children, put through the same test, make even larger mistakes and speak with even less misgiving than do imbeciles. The phenomenon has been explained in somewhat diverse manners ; but they all appear reducible at bottom to some sort or other of retention. This may equally well take the form of reproduction or of persistence. An example of the latter is the well-known Müller-Lyer illusion (see p. 210) ; for here the error seems to be best explained as the merging of one cognized item into another cognized immediately afterwards. Of similar mechanism, but with the retention strongly reinforced by conation, would appear to be the ready confidence with which most men speak out their views upon such problems as, the form of government producing the greatest general happiness, the fiscal policy securing the maximum revenue, the strategy

most conducive to victory—the advantages of a classical education, the evidence for the utility of vaccination, the fundamental basis of religion—in short, upon any matter whatever in respect of which they have great interest and almost no knowledge.

Between these two types, derived from obscurity and illusion respectively, stands a third constituted by an intimate combination of both. It may be called that of confusion. Examples have already been encountered by us frequently enough.

In all three types alike, our considerations have indicated that the immediate cause of error consists in replacing the belief deriving from the noegenetic principles by that which comes from the quantitative ones, especially in the form of associative reproduction. Right shrewdly, then, was such reproduction named by the old Schoolmen, "The Devil's Dialectic."

CHAPTER XVIII

THE INTELLECT : REASONING

DEDUCTION.

Theoretical Analysis. Range of Function. Age of Development.

INDUCTION.

Practical Importance. Analysis.

FORMS OVERLOOKED.

IMPERCEPTUALITY AS CRITERION OF INTELLECT.

DEDUCTION

Theoretical Analysis. Here, we reach the third and last level in the ascent of the Intellect as depicted traditionally, that is, "Reasoning." Such level is commonly held to consist in syllogistic deduction. The time-honoured example of this runs : " All men are mortal (major premise) ; Socrates is mortal (minor premise) ; therefore, Socrates is mortal (conclusion)." By the major premise, it is said, a statement is made about a whole class ; by the minor premise, a particular case is included within that class ; and thence, by deduction, the statement is transferred to the particular case. Put schematically, if all *M* are *P*, and *S* is *M*, then *S* is *P*.

In this, we may first consider the nature of the said major premises. And at once the question arises as to their original source ; for such proving of one proposition by way of referring it back to another of higher generality cannot go on for ever. Hence, the concession is usually made that the *ultimate* major premises hold good in their own right. As to these deductive fountain-heads, they are taken to

consist in the alleged three (or only one) ultimate logical principles (p. 280). In opposition to these and kindred doctrines, however, we here must maintain that in cognitive operations of otherwise syllogistic form the major premises need not primarily refer to any class whatever, but may deal instead with characters. Indeed, in the basal case of the major premises being *self-evident*, they always deal primarily with character rather than with class. Those that do treat of class are obtained secondarily, by means of a conversion (p. 278); the whole quantified formal logic engendered by them does not at all represent the normal course of deductive thought, but only an ingenious device for checking errors in it. Yet more, the propositions capable of serving as self-evident major premises are by no means confined to a single law, or to a triplet of them, or even to a limited set of axioms. One is supplied in every noetic process-unit that ever springs from either our second or third principle (p. 76). Even the simplest sensory perception contains material for inferences of undeniably syllogistic form. An example is the following: "That Redness is unlike that Blueness (major); this Colour is the same as that Redness (minor); therefore, this Colour is unlike that Blueness (conclusion)."

After the major premise—passing over the minor as of less interest—there still remains to be examined the process of deducing the conclusion. Of this, an accurate account so far as it goes appears to have been furnished already by Malebranche, when he described it as the cognizing of a relation between propositions. For the process does, in fact, necessarily involve an awareness of the relation of evidence between the pair of premises on the one hand, and the conclusion on the other (see p. 73). So far, then, syllogistic deduction is simply a special case of our relation educating.

Range of Function. After thus examining the syllogism from the standpoint of theoretical analysis, there may next be considered the function exercised by it in the practice of ordinary life. At first sight, this seems to have been

extraordinarily exaggerated. For if one looks at the actual course of thought as exhibited in writings or conversation, the syllogistic form—even as dealing with characters instead of classes—appears to be surprisingly infrequent. An indubitably genuine specimen is quite hard to discover. But this appearance of poverty is immediately altered into one of abundance on bringing into account, in addition to whatever can be detected in manifest consciousness, all that can plausibly be inferred in subconsciousness. Take, for instance, the following sentence picked almost at random from literature : “ The sincerity of the old English showed their greatness of mind.” Here, the complete thought seems to admit of being rendered as : “ Sincerity shows greatness of mind (major premise) ; the old English were sincere (minor premise) ; therefore, the old English had greatness of mind (conclusion).”

The syllogistic major premises are, in fact, closely akin to the eduction of relations between concepts which was considered early in the previous chapter and showed a similar tendency to remain subconscious (p. 279). They either simply consist in such eductions and represent their most usual manner of functioning ; or they consist in the analogous “ opinions ” mentioned later in the same chapter ; or else they are propositions of similar structure, but put forward as hypothetical only ; or finally, they are themselves products of reasoning performed previously. All these variations in their origin and insightfulness make no difference whatever in their acting as major premises.

The minor premises, for their part, are more akin to the semi-perceptual eductions of relation, also mentioned in the preceding chapter. They may consist of such eductions (the subsumptive variety) ; or they may have a similar structure but be only opinions. Instead of either, however, they may be purely conceptual propositions.

In order to appreciate the very great practical importance of this (usually subconscious) syllogistic procedure, we must note that in the course of time every concept becomes, so

to speak, a little depot stored in readiness to equip whatever thoughts may happen to march its way. Any item of thought, on thus coming to be subsumed under the concept, is thereby offered a pick from illuminating major premises in multitude. Thus, when the prospective purchaser of a horse takes certain bony projections on the inner sides of its hocks to be "spavins," he in so doing at once brings much light to bear upon the horse's working value. When a chemist learns that a certain substance is made of "glass," he thereby obtains information that it is, not only hard and transparent, but still more inevitably a combination of silica with some alkali. The physician, similarly, brings at least to the background of his cognitive field a mass of relational awareness so soon as he observes that his patient has a "wiry" pulse, or a "dull" lung. So, also, the farmer, when he distinguishes the "Hereford" from the "Shorthorn," or "nitrate of soda" from a "mineral phosphate." Or the employer of labour, when he notes whether a man is "capable" and "trustworthy," or devoted rather to the cult of "canny." Indeed, a large portion of all ordinary discourse and argument has no other aim than that of subsuming some object under a concept that will forthwith invest it with favourable major premises. An instance is when a commercial advertisement commences by declaring itself to be "not a prospectus but just a plain simple statement of facts."

Among the relations which a concept supplies in this manner about an object, none are so prominent biologically as those which enunciate rules how to behave towards it. A person treats very differently a thing he encounters, according as he subsumes it under "gift" or "loan," "fishing smack" or "submarine." His conduct towards a fellow-man depends greatly upon whether the latter is taken by him to be "straight" or "crooked," a "friend" or an "enemy." Hence, wisely enough, the definitions of a child—which can quite well not only be formed but even brought to overt expression already in his fifth year—tend

predominantly to express rules of usage.¹ Not so foolish, then, as might be supposed is the belief current among savage races, that to learn the names of things or persons confers power over them.

Age of Development. At what period of life does this ability to make syllogisms first develop? There would appear to be grounds for assigning to it a much earlier age than is done usually. When a boy still in his second year lays down his spoon on being told that "the pudding is hot," this proposition may reasonably be supposed to reproduce in his mind by association the proposition previously accepted by him that "a hot thing is painful"; the former proposition can then serve him as a minor premise, and the latter as a major. To such practical syllogisms he not improbably owes no inconsiderable part of his efficiency in learning, playing, and so forth.

From these cases where the major premise functions in such a dim or subconscious manner, there is eventually a transition to the cases where it obtains explicit verbal expression and is commonly called abstract. Concerning this stage, an interesting experiment may be quoted from Branford. He writes:

"I tried the common mode of abstract reasoning with the child, but (as I expected) the result was a perfect blank: she could make nothing of such a purely abstract axiom as 'things equal to the same third thing are therefore equal to each other.'"

But whence did the difficulty really arise? Our author made trial, not only of the foregoing linguistic and therefore "abstract" method of instruction, but also the perceptual and concrete method. He cut out three paper triangles exactly alike, as shown in the following figure:



FIG. 23

¹ Chamberlain, "Definitions of 4-year-old Girls," *Pedagog. Semin.* xvi. 1901.

His subsequent procedure is reported by him as follows:

"I asked the child to see if all three triangles were or were not exactly alike in shape and size. . . . The child thereupon took up *A* and placed it over *B*, side on side, angle on angle, and found that they fitted quite accurately, and agreed that they were exactly alike. Then the child took up *C*, and found, after fitting *C* on *B*, a similar result—viz. *C* and *B* were exactly alike. I was then on the point of saying, 'You see, then, that *all three* are exactly alike, when, to my astonishment, I saw that no such conclusion had presented itself to her mind, even from the foregoing tactual and ocular evidence, for *she lifted up A and C and began to fit one upon the other.*'"¹

Here we must interpose that, since the child still failed at the task after it has been rendered as non-verbal and as concrete as possible, there remains no convincing ground for attributing the difficulty to the "abstractness." It seems to derive rather from the more intrinsic nature of the task. A lesson to be drawn from the whole experiment is that even those intuitions which, like this one, eventually shine in surpassing luminosity of their own, nevertheless, in order to do so, are in need of some preparatory growth.

INDUCTION

Over and above *deduction*, there must also be considered what has often been regarded as a *second* principle of reasoning, namely, *induction*. This has been advocated with especial vigour by the school whose prime doctrine is that no knowledge can possibly have had any other warrant than that of experience. Accordingly, the syllogistic major premise—since any cosmic validity possessed by it would contradict the said doctrine—has been supposed by this school to be really experiential after all. It is declared

¹ *A Study of Mathematical Education*, 1908. The child's age is not mentioned here. But Dr. Ballard, who has repeated all these experiments, kindly informed me that it was about 6-7 years.

to derive from any event being experienced so frequently. as to induce, solely by virtue of associative reproduction, an expectation of further repetitions. In this way, all deductive operations are taken to have really an inductive foundation.

Practical Importance. Now, so far as concerns only importance in practical functioning, the claims made for induction can scarcely go too far. Science first attained to its magnificent triumphs when Galileo and others began to build up its laws, no longer upon a syllogistic basis, but upon actual observation fructified by inductive generalization. Nor does such inductive procedure by any means confine its sway to the realm of science. It rules already in the nursery; the tiniest child who has been slapped a few times for approaching too near to the fire shows every sign of believing that further approaches would be followed by further slaps. All through life he continues, as it is popularly said, to learn by experience; from his previous acquaintance with various kinds of things, he gathers what to expect from and how to behave towards them subsequently. If in deduction we encountered the most common procedure by which the "rules" are applied, here in induction we certainly have one by which a great proportion of them are engendered. The occasions and conditions of their birth—such as the wonderful facility of producing them but extreme difficulty of doing so satisfactorily—constitutes one of the most significant chapters in psychology. This holds good not only of child-growth and savage races, but equally so of civilized adults. Scarcely a human action occurs—from national revolutions to a snap of the fingers—but can in large measure be traced back to some proposition reached inductively, and for the most part on astonishingly inadequate grounds.

Analysis. All this concession to the inductive procedure in respect of practical importance, however, leaves still quite unsolved the problem of its psychological analysis. As to this latter, the extreme associationist view must

be summarily rejected. We may, perhaps, admit that induction has been superposed upon associative reproduction originally, and may even remain intermixed with it much later on. But so can the exquisite tea-rose be grafted upon the lowly dog kind, although the two none the less belong to quite distinct species.

On seeking for some less superficial analysis, the old problem of transcendence must inevitably crop up again (see p. 106). For the question must certainly be raised as to how even the greatest number of past experiences can really be competent to generate the smallest—not to say truth—even useful guide, about any future ones. And the sole plausible answer usually forthcoming is to deduce all these general expectations from some still more general propositions; this usually is to the effect that "natural events everywhere and always proceed uniformly."

This view, seeing that it makes all induction derive ultimately from a deduction, is strangely adopted by many of those very authors who had tried to explain, reversely, all deductions by induction; the elephant is made to stand on the tortoise, and also the tortoise on the elephant! But even apart from this, the view is not without difficulties. Suppose any person to be asked whether the fact of drawing ninety-nine black balls successively out of a bag renders probable that the hundredth will also be black. He will say, Yes, with the greatest confidence, even though he may never have performed any such drawings actually, and therefore will have had no opportunity for making the relevant associations. But must the explanation that he has in mind, even subconsciously, be any belief in the ubiquitous uniformity of nature? To accept this, we should have to assume that the ubiquitous uniformity of nature is cognized by all the persons—old or young, educated or uneducated, civilized or savage—who show themselves capable of learning the lessons of experience as such. And this is an assumption hard to reconcile with the teachings of comparative psychology.

Further adverse evidence, but at the same time an alternative view, is supplied by introspection. For the required major premise appears—at any rate to the present writer—to arise actually from a conviction, not so much of uniformity, as of causality; the unbroken series of ninety-nine black drawings seems to act mainly by generating a belief that the black is favoured by some persistent causative influence. And credence in some sort or other of ubiquitous causation does indubitably reign throughout all races and all ages.

Decide as we may between these two or any other plausible views of induction, all of them cannot but resolve it ultimately into some particular case of syllogistic deduction. And of this our account has been given already.

FORMS OVERLOOKED

As upshot of this chapter so far, the inductive kind of reasoning has been reduced to a special case of deductive syllogism, and this to a case of educing relations between propositions. Here once more, then, all such facts as have been already recognized under the traditional view find at once their natural place among the manifestations of our principles. But the reverse is far from happening. The facts elicited by consideration of the principles very greatly exceed, and are in nowise included under, all those of which the syllogistic view has ever been able to take cognisance.

To begin with, the syllogistic view, even as rendered by Malebranche, brings solely into account the educing of relations, and so wholly overlooks that of correlates. Yet in truth; wherever any scope exists for the former, so it does to an exactly equal extent for the latter; and this applies just as fully to reasoning as to anything else. If the premises together with the conclusion can give rise to an awareness of the relation of evidence between them, so too can the premises together with the evidential relation give rise to the conclusion. On being told that all men are mortal

and that Socrates is a man, any one can become aware that these two jointly prove the mortality of Socrates. Indeed, this second syllogistic procedure, the eduction of correlates rather than of relations, would appear to be the more important of the two. For whereas that of relations merely serves to censor the legitimacy of syllogisms already constructed, that of correlates has the office of constructing them originally. When a person is seeking to discover new truths by way of reasoning, he already has in mind the premises and also the relation of evidence; he has *not* yet usually an awareness of the correlated conclusion, but now proceeds to evoke this by virtue of the third principle.

But to the foregoing omission, grave as it is, there must be added others of no less magnitude. In order to constitute what is commonly called a syllogistic deduction, at least three particular conditions must be satisfied. First, each proposition in it must assert the relation of identity. Secondly, there must be two such propositions as premises, and one as conclusion. Thirdly, the relation between the premises and the conclusion must be that of evidence.

Let us survey these conditions in turn. The first one, limiting the propositions to those which assert identity, is so artificial and incomprehensive that it really suffers violation even in the syllogisms commonly held up as typical; in our traditional example itself (p. 289), "mortal" has not in truth the relation of identity to "Socrates," but that of attribution; for the former relation to be obtained, the proposition would have to be radically converted. In many further cases, otherwise of the syllogistic form, the relation of identity may be still more palpably abandoned (so that not even a saving conversion remains possible): "If one line is larger than another, and this than a third, then the first than the third." "If John dies before Henry, and James after Henry, then James after John"; "If the earth has originated from the sun, and the moon from the earth, then the moon from the sun"; "If the radiance of a genuine pearl is beautiful, and if that of an artificial one is indis-

tinguishable from it, then this artificial radiance must be not appreciably less beautiful." Indeed, whilst retaining the syllogistic form in all other respects, the relation of identity would appear to be replaceable by one of *any* other kind.

The second of the conditions needed to constitute a syllogism, namely, its possessing two propositions as premises and one as conclusion, would no less fatally exclude from view a vast amount of operations which should find their place here, that is to say, among noetically combined systems of propositions. For just as easily such a system can have a much greater number of premises than two; or else it can have only one. When a problem arises, be it in science, or in law, or in politics, or in ordinary life, there are usually quite a large number of arguments bearing simultaneously on one and the same conclusion. Inversely, there may from a single system of premises arise several different conclusions. Again, in a vast number of cases, only *one* premise, namely, the minor, is really indispensable.¹

No more tenable is the third and last condition, although this merely limits the operation to the case where the relation *between* one and the other system of propositions is that of evidence. For systems quite as complex can be interconnected by any other relations instead. Take, for example, that of resemblance; this may be cognized, not only between propositions and pairs of such, but also as running systematically between whole discourses or histories. It should be noted, further, that the formal logic of syllogisms, when stripped of accessories and thus reduced, one might think, to the very quintessence of "intellect," in point of fact exhibits not a perfect but rather a poor correlation with intelligence as measured in any other way.²

¹ Thus, to return to our own example (p. 280), the concrete fact of a person being unable to water his garden because he is away would seem not to need indispensably, but only to be made more lucid by, the intervention of the abstract major premise that "being in one place is incompatible with watering in another."

² This statement is mainly based upon recent (unpublished) work of the present writer.

Whichever of the conditions we regard, then, the attempt to limit the highest level of the "intellect" to the particular case of syllogisms, or even to that of inference of any sort, must result in an immense amount of cognitive operations being fatally overlooked.

IMPERCEPTUALITY AS CRITERION OF INTELLECT

Here, at the close of our three chapters on the Intellect, we may for a moment glance back at the criterion of it with which we set out, namely, its not being of a perceptual nature (p. 262). This imperceptuality has shown itself unable really to originate any new general forms of cognitive process; from beginning to end, everything intellectual can be reduced to some special case or other of educing either relations or correlates. Even the kinds of relation involved are just the same for the imperceptual as for the perceptual cognition. Moreover, the latter, no less than the former, is able to supply propositions of universal validity.

Still, this line of demarcation, so long as no exaggerated claims are made for it, must be admitted to have been chosen by the ancients very wisely. Although in all the above cardinal respects the perceptual and the imperceptual operations are alike, yet in certain other respects they do present differences which, if not sharply cut, are at least of very great moment.

One of these respects is that the intervention of perception necessitates that of experience through the sensory organs. And this imparts a marked variation to the general character of the various sciences, according as they are affected by it in greater or less degree. Two of them, logic and arithmetic, have been distinguished by Plato as the dominion of the purely imperceptive intellect alone. Hence, there is a descent to certain branches of knowledge where the perception, and therefore the sensory experience, just begins to make its influence felt. The pre-eminent instance is geometry. But, as remarked above, such alloy of sensory experience does not impair the cosmicality of purview. Indeed,

the harvest of universal truth yielded by the simple seeming homogeneous space is extraordinarily rich. Even the elementary figures composed of straight lines and circles in a single plane exhibit a variety and difficulty that have disconcerted many a generation of school children. And all these are as nothing compared with the spatial properties, topographical, projective, and metrical, which come to light in the most elementary of the solid figures, such as the bodies with plane faces, or the three round ones, sphere, cylinder, and cone.

In the other sciences, the infusion of perception with its sensory experience becomes more obviously influential. This may already be noticed in statics, dynamics, and theoretical physics. It becomes still more evident as the sciences grow more specialized, evolving into chemistry, astronomy, geology, biology, physiology, anatomy, botany, agriculture, and so forth. And there is a similar intervention of experience, this time not only of sensory kind, but of all kinds whatever, in respect of the psychological sciences; here must be included both pure psychology and its many satellites, such as education, psychiatry, history, philology, sociology, political economy, anthropology, ethics, and aesthetics.

Theoretically interesting as all these varying degrees of dependence on experience may be for philosophy, however, and even practically important as they must be for various arts (*e.g.* teaching), there are yet other problems raised by the distinction between perceptual and imperceptual cognition that at the present moment stand much more prominently in the foreground of psychological research. Most acute of all is the question which furnished the topic of our first chapter, namely, as to what has been, is, or ought to be, denominated "intelligence." To attempt to cope with this problem without having previously carried through some such analyses as have been given in the present and three preceding chapters, would seem to be labour worse than wasted.

CHAPTER XIX

MEMORY

SOME CURRENT DOCTRINES

Unitary Power. Facilitation. Reproduction Ideation Localization in Time.

RECALL OF PAST EXPERIENCE

Internal Retrospection External Retrospection Information

THE CASE OF RECOGNITION

Problem. Equivocality Principles *ad hoc* Dictionary Definition Identity deduced from Similarity Revelation by Effect. Subconsciousness.

CONSTRUCTING THE PAST

"Specious Present." Original Data of Time Primary Integration of Time. Further Integration

RECOLLECTION.

Inspiration. Ratiocination Association.

SOME CURRENT DOCTRINES

Unitary Power. From Perception and Intellect we will pass on to Memory. That this, too, constitutes a separate and more or less unitary mental power has been admitted, if not as in the other two cases by almost all psychologists, at any rate by the majority of them. Accordingly, in estimating the abilities of any person, whether child or adult, his "goodness of memory" is nearly certain to be one of the points noted. So far is this cognitive power from being identified with the others, that often it is taken to vary in inverse ratio. Thus, Aristotle observed that those persons who have good memories are apt to be slow of wit ¹ As for more popular opinion on the nature of memory, literature

¹ *De Memoria*, 449 b 4.

abounds with references to it as having some sort of unitariness. We read that,

"A man's real possession is his memory. In nothing else is he rich, in nothing else is he poor."

Or, again, in fervid poetry,

"Thou who stealest fire
From the fountains of the past
To glorify the present, O haste!
O strengthen me, enlighten me,
I faint in this obscurity,
Thou dewy dawn of memory."¹

And dramatically confirming such views, there occur from time to time those curious cases in which a man's memory is said to be altogether lost; he stands unable to recollect where, or whence, or even who, he is.²

Facilitation. Now, on attempting to submit this "memory" to psychological analysis, many writers, trying to stress the analogy of the mental to material phenomena, and not unwilling perhaps to confer on their doctrine an attractive savour of paradox—have extended the meaning of the word so as to cover any mental event that happens to involve conspicuously the principle of *retentivity*. Accordingly, the meaning of memory (and especially that of the Greek synonym, *Mneme*) has been so stretched as to include the bare facilitation of events by the previous occurrence of similar ones. Just the same used to be done in ancient times also, as when Campanella likened remembrance to the easier folding of a piece of paper at the place where it had been folded on an earlier occasion.

But language takes its revenge for undue liberties ventured with it. This new meaning so arbitrarily imposed has never been able to find consistent adoption, even by its sponsors; they have been no more able than any one else to say

¹ Tennyson.

² An example of this affliction and its cure is given in the luminous little work of *Psychology and Psychotherapy* by W. Brown.

habitually and seriously that a piece of paper "remembers" having been folded before. And whilst thus in some respects mere facilitation signifies far less than anything that can with propriety be called remembrance, in other respects it extends to far more, seeing that it may occur in mental events of all kinds; for none, not the most purely noegenetic, nor even conative or affective,¹ are altogether insusceptible of being facilitated by previous occurrence.

The part played by facilitation with regard to memory, then, must be taken by us as at most that of an indispensable pre-requisite. And this is very different from being identical. The catching of a fish is not the same as the cooking of it.

Reproduction. Those who would trace memory back to retention have more particularly tried to depict it in the guise of associative reproduction. As an instance, we can scarcely surpass the ancient illustration of Vives. The thought of a ring excites that of the goldsmith who made it; the smith, in turn, recalls the queen's necklace; this summons to mind the war waged by the queen's husband; thence, there is a mental passage to their children; and from the children, to the lessons which they have been receiving at school.²

But even this is still inadequate. For—apart from the insufficiency of genuine reproduction to cover nearly all the events commonly included under the term (see Ch. VI.)—we at once encounter the conflicting case of sensory perception. This is garnished profusely with associative reproductions (Ch. XIV.), and yet is not thereby transformed into remembrance. Even the extreme instance of taking a waxwork to be a real man would never be called the "remembering" of a man.

Ideation. Another analysis of the general nature of memory is that in which it becomes regarded as "ideation"; it is said to be

"the power of the mind to ideate (*vorstellen*), to have

¹ For experimental evidence, see *Motive-force and Motivation-tracks* by E. Boyd Barrett, 1911.

² "De Memoria et Recordatione," *De Anima*, 1539, bk. ii. ch. ii.

ideational contents—the possibility of ideational contents occurring in the mind : thus constituting memory.”¹

But even this position—adopted though it is by what seems to the present writer to be the best hitherto published treatise on the topic—cannot be accepted. For under the term “ ideational contents ” (*Vorstellungsinhalte*) would have to be included all items of awareness other than sensory perception. And throughout the present work we have been ascertaining that the presentation of non-perceptual items can arise from a source wholly unlike, not only memory, but even reproduction of any sort ; it can spring, namely, from education.

In order to obtain a concept of genuine memory, then, the condition that the awareness should have “ ideational contents ” may perhaps be necessary, but certainly is not sufficient.

Localization in Time. If we would better the concept, we must at least hark back to Aristotle and add on a localization time.² Further, this must, of course, be the time that has passed. Hereby, matters are much improved ; on being localized in past time, the reproductive accompaniments of perception do admit of being named remembrances. Inversely, on all reference to past time being cut out of the illustration of Vives, there remains only a flight of ideas whose title to be called memory becomes invalid.

But many cases still remain recalcitrant. Among the most elaborate localizations in past time are, for instance, the discoveries of geology. And yet no one can reasonably claim that the paleozoic or archæan periods are “ remembered ” by him.

RECALL OF PAST EXPERIENCE

Internal Retrospection. Such difficulties suggest the existence of some further condition as required in order to bring

¹ Oeffner, *Das Gedächtnis*, 1909, p. 5.

² μετὰ χρόνου πάντα μνήμη, *De Memoria*, 449 b.

the term memory into accordance with normal usage. It would seem that the pastness must needs be primarily that of the person's own experience, and owing to that experience, and regarded as that experience. Accordingly, one class of events that everywhere do and must receive the name of memory consists in a person's recall of his own previous acts and states as such. Thus, already Augustine writes as follows :

" I perceive, that the present discerning of these things is different from remembering that I often-times discerned them, when I often thought upon them. I both remember then to have often understood these things ; and what I now discern and understand, I lay up in my memory, that hereafter I shall call to remembrance, that I have now been able to remember these things, by the force of memory shall I call it to remembrance.

" The same memory contains also the affections of my mind, not in the same manner that my mind itself contains them ; but far otherwise, according to a power of its own. For without rejoicing I remember myself to have joyed ; and without sorrow do I recollect my fear ; and without desire call to mind a past desire. Sometimes, on the contrary, with joy do I remember my fore-past sorrow, and with sorrow, joy." ¹

External Retrospection. Into a second class we may gather together the person's recall of his previous external-appearing cognitive objects, including, in particular, his sensory percepts. For a description of these cases, we once more turn to the not since surpassed eloquence of Augustine.

" There (*i.e.*, in memory) are all things preserved distinctly and under general heads, each having entered by its own avenue ; as light, and all colours and forms of bodies, by the eyes ; by the ears all sorts of sounds ; all smells by the avenue of the nostrils ; all tastes by

¹ *Confessions*, bk. x ch xiii-xiv.

the mouth ; and by the sensation of the whole body, what is hard or soft ; hot or cold ; smooth or rugged ; heavy or light ; either outwardly or inwardly to the body." ¹

To such basal items of perception must be added its super-structure of relations, concepts, adjuncts, and so forth, as detailed previously (Ch. XIV.). Not bare colour, but rather coloured places, things, and persons, fill up the gallery of visual reminiscence. This is hung with views of successive homes, of familiar neighbourhoods in town or country, of foreign encounters on land or at sea ; it is embellished with phenomena of science, brought perhaps by the microscope out of the infinitesimally small, or by the telescope from the illimitably remote ; it is garnished with an endless array of human forms and faces, young and old, beautiful and ugly, loved and hated.

So, too, in the other departments of sense. With sound, for instance, it is not so much the basal tones or noises that are preserved for us, as the more complex structures supplied in music and language ; friendly sayings that still charm, affronts that have not yet lost their sting ; utterances of our own that continue to haunt us, perhaps just because we would so gladly have snatched them back again.

In all such cases, a reference to the person's own past experience, even if not expressed, would at any rate appear to be involved implicitly. To say that I remember the voice of a singer means not merely that I know how it used to sound, but how it did so to me as hearer.

Information. The two preceding classes comprise all those feats of memory which derive from the person's own previous experience in the most obvious manner. But in neither class is account taken of such performances as the remembering that William I. came over to England in 1066, or that the chief sources of the Nile are the Victoria and the Albert Nyanzas. A third class must be accordingly introduced, namely, one which includes a person's "information

¹ *Ibidem*, bk. x. ch. viii.

about " things, as distinguished from those remembrances which come from direct " acquaintance with " them.

A large part of such information has its origin in communications. These are liberally tendered to the infant from the very day of his birth ; and in a few months, some fragments show signs of having penetrated to his understanding. Before even able to talk, he can evidently both comprehend and remember various items told to him, such as that his mother has gone away, that some utensil is dirty, or that the cake must not be eaten till after the bread-and-butter. And with further linguistic progress, his acquirements of this sort accumulate rapidly.

Besides what is thus communicated to him, there must also be reckoned to his remembered information much even of what he has in the first place learnt for himself (as described in the preceding chapters). The genuine warranty for his beliefs, even when having originally consisted of genuine evidence, soon fades into a mere remembrance of having done so.

His enrichment with remembered information is further accelerated when no longer left to haphazard, but brought under the control of systematic pedagogy. From his entrance into the kindergarten to his departure from the university, the chambers of his memory are being uninterruptedly stored with all the information that his educational governors hold to be of the highest value. And even afterwards, conversation, reading, and thought still carry on the accumulation.

Now, as regards this third class, the reference to the person's own past experience (and even to pastness at all) may sometimes at first sight incline to be dubious. Neither the one nor the sort of reference would appear to be in consciousness quite indispensably when, in our former instance, remembering facts about the sources of the Nile.

Still, whoever believes such facts will almost always, if not actually evoke, at any rate be able to evoke some awareness of having in the course of his own previous

experience assented to them. And as for the extreme case where a proposition is indeed believed without either any such actual or even revivable notion of ever having learnt it, this is the exception that proves the rule ; for to such a totally irresponsible credence as this, the title of remembrance is no longer properly applicable.

THE CASE OF RECOGNITION

So far, then, our analysis of memory ends by resolving every case into a person's recall of his own past experience, regarding it as such. Before pursuing the analysis further, we will stop to consider another case, which we have hitherto avoided, and which is currently regarded as the sister process to the recalling of the past ; this is, the "recognizing" of the present.

Problem. The latter process includes, to all appearances at least, much of the most actively developing cognition in the first few years of life. Thus, the child comes to "know" his father and mother, brothers and sisters, attendants and friends, the dog, the cat, or the parrot. Similarly, he arrives at recognizing places, his bedroom and nursery, the garden, the neighbouring streets, or his habitual walks in the park ; also the houses, towns, and districts to which he pays occasional visits. His recognition embraces also a large number of "things," especially such as he takes to be his own property, his rattle, drum, spoon, books, shoes, marbles, cherished bits of wood or paper.

Under his power of recognition fall, besides such individual concrete objects as people, places and things, also abstract qualities or other characters. And in this field also, the child reveals his ability before he can even talk. For example on seeing a red ribbon, he may pick up his red pinafore with what cannot but be accepted as recognition of the colour. Still more clearly does he manifest this power when he begins to master the rudiments of speech. If his mother shows him a cow and utters the onomatopoetic "moo," he may shortly afterwards point to another cow and say "moo" himself.

Now, although this operation of recognizing is performed every day of a man's life, one might almost say every minute, its explanation has caused psychologists no little perplexity. In the careful study of Katzaroff, for instance, we find the current theories sorted into no less than fourteen different general classes, which still allow considerable further variety of view within a single class.¹

Equivocality. A large portion of the difficulty may be traced, once more, to the misuse of words. Many authors have taken "recognition" in arbitrarily different meanings, whilst others have not seriously tried to get definiteness of meaning at all.

In the English and the French languages, there has not commonly been made even the obvious distinction which German brings at once to expression by having at any rate the *two* current names, *Wiederkennen* and *Erkennen*. The latter properly denotes only subsumption under a concept. And this operation, although often included along with "recognition," is not intrinsically of a nature that entitles it to be called memory of any kind.

Even when limited to the sense of *Wiederkennen*, however, the word "recognition" has been invested with a bewildering variety of significations. Sometimes it has been restricted to the being aware of previous "acquaintance with" the object, whilst at other times it has been extended to any remembering of "information about" it. Again, sometimes it has been taken to mean pre-eminently a presentation of the object as belonging to the past *in general*, that is to say, not localized in any particular region of it.² At other times, an object has been said to be recognized when it only reproduces some of its former concomitants, without the fact of such former concomitance now coming to awareness. Occasionally, authors seem to maintain that the prefix "re-" simply indicates that the cognition is of some object the like of which has been cognized by the same person

¹ "La Récognition," *Archives de Psychologie*, xi 1911.

² James, *Principles of Psychology*, 1. p. 673.

before.¹ Or they may go so far as to confer the name on a perception when it presents no constituent even resembling any antecedent experience, but only possesses some character from which a psychologist examining the event might possibly infer such antecedence. At least, this is the only apparent ground for the occurrence of a recognition being asserted merely because the object evokes a mechanical or a co-ordinated reaction.²

Principles ad hoc. A still more serious fault may be charged against most of the theories of recognition in vogue. This is that the explanation has not been discovered in any principle shown to underlie cognition in general, but instead has been furnished by some proposition, of the nature of a principle, but devised specially *ad hoc*. An example of this at which the present generation may smile is the naïve psycho-physiology which depicted the effect of the antecedent impression as "rendering the nerve fibres more supple."³ But still even in our own day, the antecedent impression is taken as "producing in the nerves a disposition to molecular changes of position of a certain kind" whereby on a second similar impression being made, these fibres are apparently supposed to have a feeling of "ease" (*Leichtigkeit*).⁴ Yet another special principle is invented whenever the producing of recognition by such feelings of ease is declared to be "one of the unanalyzable givens of psychological science."⁵

Sometimes the invention *ad hoc* takes just the contrary direction; the power to recognize is not ascribed to any facilitating resemblance between the past and the present impression, but instead to an antagonistic difference between them. According to this view, the present actual sensation is credited with the peculiar virtue of "repelling" the

¹ Ward, *Psychological Principles*, pp. 183-5.

² Bergson, *Matière et Mémoire*, p. 74.

³ Bonnet, *Essai Analytique*, ch. ix. 1754.

⁴ Höffding, *Psychologie*, 1893, V. B. 1.

⁵ Owen, *Psych. Mono.* xx. No. 2, whole No. 86, 1915.

discrepant constituents of the reproduced image to a time-distance mathematically proportional to their amount of discrepancy.¹ Curious to observe, however, other writers, as Bain, though also assuming the occurrence of this "repulsion," ascribe to it, not the causing, but the preventing, of recognition.² Nor can even those be exempted from the charge of inventing *ad hoc* who say, to explain recognition, that,

"Nascent cerebral excitation can affect consciousness with a sort of sense of the imminence of that which stronger excitation would make us definitely feel."³

For this way of writing would appear to imply that weak physiological processes are dowered intrinsically with the strange power of generating a belief in the subsequent occurrence of strong mental ones.

Dictionary Definition. Now, all these faults chargeable against current theories of recognition, such as arbitrariness and confusion in the meaning assigned to the word, and the fabrication of explanatory principles *ad hoc*, would seem to be in large measure preventable by the simple plan of consulting a dictionary. Preferably, to start with, this should be an *ordinary* one, which has not been embroiled in controversies, but instead renders fairly and faithfully the usage of the word that has been prevalent, and that consequently is bound to recur. In this way, we may obtain the plain enough definition, that to recognize is "to know something as identical with something known previously."

At bottom, then, it is merely a special case of awareness of the relation of identity. This latter may either involve *subsistence*, or else refer only to *character*. Thus, there may be recognition of having seen the same cathedral before as a subsisting thing, or else the same architecture as an attributive style.

Identity deduced from Similarity. Basing ourselves on these

¹ Taine, *De l'Intelligence*, 1879, pt. ii. bk. i. ch. ii. (V).

² *Senses and Intellect*, 3rd ed. 1868, pp. 460-1.

³ James, *Principles of Psychology*, i. ch. xii. p. 673.

clear notions, we may now easily see that recognition, in the sense of awareness of identity of either of the said kinds, is often traceable to nothing more than an awareness of similarity (including the sort involved in what is commonly but loosely called "congruence"). When this is so, the whole operation is only what has been already described as a deducing of relations by means of substitution (Ch. VI.); one relation (here that of identity) is cognized by inference from another relation substituted for it (here that of similarity). As to the precise nature of the inferential procedure, this is a different question according as the identity is the one involving subsistence or only that referring to character. The former case cannot be treated before entering upon the further question—not within the scope of this work—of the apparently subsisting *ego* itself. In the other case, however, that of identity of character, an answer can be given forthwith. There would appear to exist an intrinsically evident (eductive) awareness that identity of character and perfect similarity of character are two indissolubly united aspects of one and the same fact, somewhat as the convex and the concave sides of one and the same curve.

In much of the experimental work on the topic, this eduction of similarity (substituted for that of identity) has been caught in its simplest form. Several objects are exhibited and then, before the immediate remembrance of them has completely faded away, they are re-exhibited in company with some fresh ones; hereupon, the relation of similarity between the remembrances and the new percepts is educed in the ordinary manner.

There is also a kindred but somewhat less simple form, where—usually, by reason of greater lapse of time—the first cognition of an object has completely departed from consciousness before the second enters into it. In such case, two steps become necessary; first, the object as cognized later must reproduce the object as cognized earlier; this is effected through their mutual similarity. And next, the relation of similarity must itself be cognized (as in the

preceding form). Of this less simple form, also, abundant instances have been furnished experimentally.

Revelation by Effect. In addition to all such procedure, however, experiment has also revealed a radically different kind. Here, the object as cognized later does not really reproduce the object as cognized earlier, but only displays some effect of an earlier cognition having occurred. Occasionally this effect consists in the reproduction of some quite unlike item. Thus, a sonata may be recognized solely because of its calling to consciousness and tenaciously keeping there some idea of a previously visited concert hall; it is consequently taken to have been heard in that hall.

The kinds of effect thus serving as criteria are, if we may accept the usual experimental reports, by no means restricted to reproductions, but comprise such characters as increased rapidity of rise in consciousness, decreased concomitant feeling of effort, various visceral or hedonic states, and so forth. But most of these reports seem not to be quite beyond the reach of criticism.

Subconsciousness. After exhausting all such cases, where either a substituted relation or a revelative effect can possibly be detected introspectively, there still remain a considerable proportion—estimated in one very careful and valuable investigation, for instance, at 18 per cent.—where a percept is taken to be a former acquaintance although *no basis at all* for this being done can be anywhere discovered.¹ And this case above all others would appear to have been the stumbling-block in the way of explanation and the cause of the distressing strife.

Yet really, such an evading of introspective notice is not in the least exceptional. It occurs just as frequently and quite analogously in all other sorts of eduction (see Ch. XI.). It is fully explicable by the fact that introspection, like every other noetic achievement, has even under the most favourable conditions still a limen below which it ceases to be feasible.

¹ Owen, *Ibidem*.

In this way, then, the particular case of recognition would appear to be easily enough explicable after all ; from our present standpoint, the great controversy comes down to the proverbial storm in a teacup. The operation consists in little more than an identification by way of inference, the latter taking two main forms, both familiar to us already (deduction from similarity and indication by effect). The reason why the case earns the distinctive name of recognition is because one of the identified terms happens here to be something recalled from, and viewed as belonging to, the person's past experience (the other identified term is usually a percept, but may be any cognized item). The only point still requiring explanation, then, is the *possibility at all of recalling past experience and viewing it as such*. In this way, the problem of recognition becomes shorn of all its special difficulties and merges into that of memory in general ; we are brought back to just the same position as before (p. 309) ; the question again confronting us is as to how an experience can subsequently be reproduced, not simply in the same manner as it was apprehended originally, but now as appertaining to the past ; its pastness, primarily a mere historical fact, has by some means or other become blazoned upon it in present consciousness.

CONSTRUCTING THE PAST

The problem to which we are thus inevitably conducted, that of cognizing past experience as such, is admittedly among the most difficult in the whole range of gnosiology and among the most pregnant for the issues of ontology. Here, we can only touch upon it with the brevity adapted to the scope of this work, which is solely psychological and by predilection practical. Nevertheless, the position which we have gained seems not without hope of incidentally throwing some rays of light even down to the depths of this dark matter.

"Specious Present." The first step towards cognizing experience as past can hardly be other than that of appre-

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hending it as *present*. And on this latter point, we are obliged to take some notice of current psychology having been largely inspired by the following remarkable passage of Clay :

"The relation of experience to time has not been profoundly studied. Its objects are given as being of the present, but the part of time referred to by the datum is a very different thing from the conterminous of the past and future which philosophy denotes by the name Present. The present to which the datum refers is really a part of the past—a recent past—delusively given as being a time that intervenes between the past and the future. Let it be named the specious present, and let the past, that is given as being the past, be known as the obvious past. All the notes of a bar of a song seem to the listener to be contained in the present. All the changes of place of a meteor seem to the beholder to be contained in the present. At the instant of the termination of such series, no part of the time measured by them seems to be a past. Time, then, considered relatively to human apprehension, consists of four parts, viz., the obvious past, the specious present, the real present, and the future."¹

This reflection has been further developed by James with his wonted brilliancy as follows :

"In short, the practically cognized present is no knife-edge, but a saddle-back, with a certain breadth of its own on which we sit perched, and from which we look in two directions into time. The unit of composition of our perception of time is a *duration*, with a bow and a stern, as it were—a rearward- and a forward-looking end. It is only as parts of this duration-block that the relation of *succession* of one end to the other is perceived."²

¹ *The Alternative*, p. 167.

² *Principles of Psychology*, i. p. 610.

Upon this basis many psychologists have committed themselves to a veritable revolution. The "specious present," regarded as a "duration-block" has been raised to the status of the sole present with which psychology is concerned, whilst what Clay still called the "real" present is degraded into a more or less superfluous fiction.

Now, to the present writer, the basis of this attempted revolution seems to be singularly inadequate, even in respect of simple introspection. On listening to a succession of musical notes, these do *not* appear as if originally contained in one and the same present, but each comes in its own present, and is connected with the previous notes by distinctly perceptible relations of sequence. Any person, without waiting for music, can immediately verify this statement by carefully listening to the tick of his watch. The "specious present" or "duration-block" is clearly—one might almost say, glaringly—a later arrival.

Original Data of Time. This fact takes back our search for the real original datum of time-awareness, then, at least as far as the perception of nowness and especially of sequence. With respect to this awareness, the current doctrines are very numerous. Omitting those which are mainly metaphysical—including the contention of realism versus idealism, and such disputes as whether time contains experience or experience time—the original perception of nowness, and particularly of sequence, is attributed by some authorities to direct intuition, but by others to mediating clues. These latter, again, are conceived in very varying manners. According to many writers, including perhaps Aristotle, Berkeley, Hume, James Mill, Ch. Wolff, and Herbart, they consist in the perpetual changings of consciousness. Others, as already Augustine, and a great many moderns, maintain that the mediating indications consist in the shiftings of attention. For others, including Hobbes, Bonnet, and F. A. Lang, they are muscular movements. For others again, as Vierordt and Mach, a peculiar kind of sensation is devoted to this special purpose alone. And for yet others, as J. Fichte

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and Riehl, they consist in awareness of states of the self. The manner of functioning of such media, too, is conceived in different fashions. The most radical is to take them as "temporal signs" that generate presentations of time by some sort of mental chemistry. The more moderate way is to regard the media as merely certain favoured items of consciousness wherein alone the flux of time can be actually observed.

In neither version, however, would any of these alleged media appear to receive support from scientific investigation. Indeed, some of them may be taken to have been definitely refuted, as for instance Augustine's theory of attention, although it still enjoys much favour. For experimental evidence has long shown that sequence can be detected down to intervals of extremely minute dimensions, perhaps as low as .002";¹ whereas shifts of the so-called attention (that is, the focus of cognitive intensity, see p. 159), have more recently been proved to need, even with maximal effort, as much as .3".² Little better has fared the most ancient, universal, and confident of all the theories, namely, that the awareness of sequence basally depends upon that of change. No doubt, consciousness is extremely liable to changes. But between the amount of these and the seeming duration, research has not succeeded in discovering any direct dependence.³ No reason whatever has been forthcoming why the qualitative uniformity of anything should preclude cognition of its extension in time a whit more than of its extension in space.

Dispensing with all such strained, untenable, and apparently quite superfluous theories of mediation, the simple truth would appear to be that the perceptions of nowness and of sequence are just elementary cases respectively of

¹ Exner, *Pflegen's Arch* xi.

² In the present writer's laboratory the most exceptional persons have only been able to reduce the time needed down to .2".

³ The experiments with "filled" and "unfilled" periods must be taken to have broken down.

apprehending the characters of experience and educing relations between these characters.¹

Primary Integration of Time. Superposed on this original datum of continuously experienced and cognized nowness and sequence, there comes the further operation by which the amounts of both are added up. Give half a dozen quick raps on the table, and the occurrence of such an integrative operation is unmistakable. Replace the raps by a continuous tone, and the integration will show itself to happen just as before; manifestly it does not wait for any changes of content, shifts of attention, muscular movements, and so forth, but proceeds as homogeneously and continuously as the time itself.

As for the cognitive form of the integrative operation, let $a, b, c, \dots z$ denote consecutive instants of experience. Then the sequences $a-b, b-c, \dots y-z$ are apprehended as conjointly constituting the total period, $a-z$ (see p. 114). And on reaching z , this is perceived to be "now," so that the $a-z$ becomes "before-now." But from these two ideas to that of "past" is an eduction precisely like that from "opposite-to-good" to "bad."²

In this manner, an experience, after having occurred actually, is presented in perseverative ideation as continuously receding pastwards. In proportion as the perseveration subsides, the presentation naturally becomes fainter; and after a very few seconds, it sinks below the limen. There is seemingly no further "immediate" remembrance. This so easily explicable phenomenon, then, this and nothing else, would appear to be all the genuinely factual basis for the "specious present" and the "duration-block."

With such sinking below the limen, however, the operation

¹ The above view seems to be in good harmony with the following passage of Wildon Carr: "We modify reality by impressing on it a mark of the past in the present act by which we grasp it" (*Proc. Arist. Soc.* 1916-7, p. 16), but the word "past" should perhaps be replaced by "passing."

² An analogous eduction generates the idea of the "future."

does not really terminate. The subliminal stratum furnishes scope, not only (as we have seen) for cognitive activity of all sorts, but for this integration of past time in especial degree. Well-known manifestations are the punctual waking at a pre-determined hour and the executing of mandates in post-hypnosis. Still, even such weak subliminal activity demands as always, some however small share in the output of general "energy"; hence, when this energy has intense calls upon it in other directions, the integration can only be performed imperfectly, so that the time seems short on account of one "being so busy."

The integration is not confined to thus welding together the earlier and the later happening items into a "duration-block." At right angles, as it were, there is also effected an analogous integration of the simultaneously happening items into what might equally well be called a "coexistence-block." Illustrations of this and its functional importance have been supplied experimentally, as in the following instance:

"A word called up a kitchen utensil, and we remembered that we had been in the kitchen while reading the list, hence the word belonged to the list read on that day."¹

Here, the reading of the list and the sitting in the kitchen had been perceived in the relation of simultaneousness, which welded them into what was thereafter the "coexistence-block."

Often intimately cooperating with such temporal integration is the further, quite analogous, and much more easily examined integration in respect of space. A fine example has been furnished by the investigation of Rüsche (under the supervision of Wirth) entitled the Ordering (*Einordnung*) of new impressions into a previously given "Total idea" (*Gesamtvorstellung*). Similar results have been obtained, too, by Pechstein, in his interesting researches

¹ Strong and Strong, *Amer. Journ. Psych.* xxvii. 1916, pp. 314-362.

on learning to traverse a maze.¹ He describes this operation as one in which

“each aspect of the course . . . is located in reference to all the details of the course and to the entire objective environment.”

As indicated by the last words, the extent of such integration, durative, coexistential, spatial and otherwise, would appear to extend over the entire field of awareness, both manifest and even subconscious.

Further Integration. A large and important part of the integration, however, occurs at a much later date and in a less direct manner. As an instance, a tourist may learn how long ago he reached a certain town, not by any summation of the intervening time, but simply by consulting his watch. A man may know in what year an exceptional frost happened, by noting that such a year coincided with his leaving school, coming of age, getting married, or some other permanent landmark in his life history. Or again, the whole character of pastness may be reached inferentially, as when an idea is dated a long way back owing to its being very faint. Should, as seems to occur sometimes, this faintness arise only from some cerebral disorder, the result may be a crop of illusions of memory.

Instead of such radical posterior integration of remembrances, there may occur only some modifying of integrations already effected. Thus, a journey, a university career, or a war, may afterwards appear to have lasted an exaggeratedly long period, owing to its having comprised a large number of distinct events. Of like nature is the well-known tendency to re-paint bygone events in brighter hues than was done whilst they were being actually experienced.

RECOLLECTION

After all, however, we have so far only concerned ourselves with the first half of the whole business involved in remembering ; an account has been given of how a person

¹ *Psych. Mono.* xxiii. whole No. 99, 1917.

builds up a comprehensive record of his past experience ; but there still lacks an explanation of how he manages to revive this record, and the required portion of it. Herewith, we encounter the problem, conspicuous throughout psychological history, of "recollection." In what light does this ancient problem display itself to our present standpoint ?

Inspiration. The explanations hitherto offered for recollection appear to have been along at least three basally different lines. The first of these, emanating from the Platonic school, and securing in various ages several illustrious advocates, is in modern days finely formulated by Bergson.

"Suppose that a remembrance is to be elicited, a period of our history to be evoked. We have awareness of an act *sui generis* by which we detach ourselves from the present to replace ourselves at first in the past generally, and then in a certain region of the past, a work of groping, similar to the focussing of a photographic apparatus. But our remembrance still remains in the state of being virtual ; we thus simply dispose ourselves to receive it by adopting an appropriate attitude. Little by little, it appears as a nebula which is about to condense ; from being virtual it passes into the state of being actual."¹

Ratiocination. The second or ratiocinative explanation, enunciated already by Aristotle, became soon afterwards regnant, and remained so for many centuries. He wrote :

"Recollection (*ἀνάμνησις*) is like a syllogism. One who recollects comes to the conclusion that he saw or heard or had some such experience previously. . . . Owing to its nature, recollection accrues only to those that have the power of deliberation, for deliberation is a sort of syllogistic process."²

Association. The third or associative explanation has its

¹ *Matière et Mémoire*, p. 144.

² *De Memoria*, 453 d, 12-15. Trans. by Ross.

origin also with Aristotle. For the aforesaid deliberative reconstruction of the past was not taken to constitute the whole of memory, but only the upper portion. On a lower level—most trenchantly and emphatically separated off from the higher one—was the revival of the past in a spontaneous manner (*μνήμη*) by means of association, a feat taken to be within the compass even of the lower animals. But subsequently, this lower and merely associative reproduction came to assume—with the development of associationism in general—a dominant place for explaining recollection altogether. Its mode of function in deliberately evoking a remembrance is dramatically depicted by James as follows :

“ The forgotten thing is felt by us as a gap in the midst of certain other things. . . . Through hovering of the attention in the neighbourhood of the desired object, the accumulation of associates becomes so great that the combined tensions of their neural processes break through the bar, and the nervous wave pours into the tract which has so long been awaiting its advent. And as the expectant, subconscious itching there bursts into the fulness of vivid feeling, the mind finds an inexpressible relief.” ¹

Now, each of these three versions of recollection would seem to be more justified in what it asserts than in what it denies. Each contains an important core of truth, so that they should be regarded, not as really opposing but rather as supplementing, each other.

Let us consider first the Aristotelian or ratiocinative theory. The fact that remembering does include a very large amount of rational reconstruction is admitted universally. Integration of the past, as described above, soon begins to regress into disintegration once more. The mental tissue—whether by defective weaving originally, or by subsequent wear and tear—suffers the fate of Penelope’s web in always becoming unravelled again and in continually

¹James, *Principles of Psychology*, i. 586.

needing to be more or less re-woven. Nevertheless, to identify outright the recollection with such reconstructive processes, would appear to be a grave exaggeration. Moreover, these reconstructive processes are not effected by deliberate recollection alone, but also very largely even during spontaneous revival. And, as is still more important, in both cases the said processes are not primary but only secondary; they cannot create recollections, but only work upon such as have already been supplied from elsewhere.

Turning, next, to the theory of associative reproduction, this too appears to be rightly enough emphasized as a very influential factor in recollection. But much too simple a view seems to have been taken of the precise manner in which it functions. As to the "hovering in the neighbourhood of the gap," this does not appear to occur in the normal unsophistical procedure at all, but rather to be only a special mnemonic device (and not even very effective).

Coming lastly to the Plato-Bergson theory, according to which "we detach ourselves from the present and replace ourselves in the past," this must be admitted to offer, on first glance at any rate, a remarkably faithful likeness to the actual unbiassed evidence of introspection. But still we must entertain doubts as to whether the analysis has been deep enough. In the first place, it has only left us with a mysterious inspiration, quite severed from all that is otherwise known to psychology. In the second place, it says, "We replace ourselves in the past"; but this is certainly not the real past, since *that* has gone for ever; reasonably, it can only be taken in the sense of a mentally presented past. To the theory, then, there must at least be added some account of how such a presentation of the past has ever managed to be constructed; this, we will hope, has been satisfactorily furnished in the present chapter. But in the third place, even this still leaves us unsupplied with any account of the manner of recall. "Detaching ourselves" and "replacing ourselves" are rhetorical figures of speech

rather than sober psychological analysis. In truth, there would appear to be here two alternative explanations between which the choice is difficult. The one is that the recalling of the past consists of a correlate-eduction closely followed by a reproduction, as particularly expounded in Chapter X. But to this solution some rather serious objections were found (p. 145). The other alternative is that the seeming recall has instead the nature of an inward observation ; every one, on this view, perpetually carries about with him a comprehensive, though subconscious, presentation of his whole past experience (see *ibidem*). Instead of any absolute bringing of the past into mind, there occurs an intensifying of a presentation already existent, albeit extremely faint and defective ; and as thus intensified, this presented past is next submitted to what we have called "exploration" (p. 102). As for genuine reproduction, to this would fall, on such a view, only the still remaining task of rendering the apprehended past more complete. And this would preponderantly occur in the "diffuse" manner mentioned on p. 137 ; here is the bald fact upon which Bergson bestows his literary adornment.

All through, then, every operation legitimately ascribable to "memory" admits of perfectly straightforward reduction to just the same principles as have guided us everywhere hitherto.

CHAPTER XX

IMAGINATION

TETRAD OF POWERS.

EXAMPLES FROM FICTION.

Play. Daydreams. Fictive Literature. Analysis.

EXAMPLES FROM ABSURDITY.

Pathology. Dreams. Emotion. Ignorance.

EXAMPLES FROM INSPIRATION.

Physical Discovery. Psychic Invention. Hypotheses. Analysis.

REALIZATION OF THE ABSENT.

The Distant and the Past. The Future.

CONCLUSION.

TETRAD OF FACULTIES

AFTER considering the Sense and the Intellect accepted by nearly all psychologists and also the Memory added by most, there still remains a fourth and last cognitive faculty admitted by a not unimportant minority. Various names have been bestowed upon it, but most commonly that of "Imagination," or "Invention," or "Origination" (see p. 25). It has been more or less clearly conceived as *the creative power of the mind*.

In this way, a remarkable tetrad has been set up. The Sense is made responsible for the cognitive content which is directly obtained from present experience; the Memory, for that which is remembered from experience in the past. The Intellect, for that which mirrors, from beyond experience, the structure of the whole real cosmos. There seems to be left over, then, for the Imagination that cognitive content which is created spontaneously by, and conforms solely to, the mind itself.

The supporters of this fourth power take the said creativeness to be genuine. In the extreme form of such a view—to which must be reckoned the popular belief on the matter—the imagination makes an absolute beginning, fashions out of nothing, and is emancipated from all laws. It escapes the thralldom of being comprehended by science. Above the mediocrity of talent, it soars into the brilliancy of genius. It inspires the hero, the poet, the reformer, the prophet.

By the majority of professed psychologists, on the other hand, the apparent creativeness is claimed to have been explained away. The imagination is asserted to do really nothing more than bring old cognitive elements into new combinations. Even the newness of the combination is represented as being merely the chance effect of associative reproduction. Elements which originally have been experienced apart, it is said, happen subsequently to be reproduced together.

EXAMPLES FROM FICTION

Now, in order to ascertain the real general nature of what is thus termed imagination, it seems advisable to examine in turn each of its chief types. Of these, the greatest perhaps is that which may be broadly designated as fiction.

Play. At what age and in what manner this has its commencement, cannot easily be ascertained. But the earliest occurrences of it are almost certainly in the course of play. Probably, however, they are not in the most primitive stage of the latter. For this appears to consist exclusively, or nearly so, of activities that are either slavishly imitative, or else wildly capricious; sometimes the child at this stage copies the persons about him in respect of voice, facial expression, gesture, or behaviour, as faithfully as he possibly can; at other times, he babbles sounds, contorts his face, rushes from one chair to another, gyrates round and round, with the wantonness of a gambolling puppy or a volitating gull.

Later on, however, these two primitive founts of self-education, imitation and caprice, flow into a single stream ; the imitative activities are enriched by an admixture of capriciousness, whilst conversely the capricious activities become based upon imitation. When this happens, there is generally introduced an unmistakable constituent of fiction and, accordingly, an undisputed title of imagination. For example, a child known to the present writer used in the beginning of her second year to spread out the newspaper on a sofa and pore over it, rotating her head solemnly from side to side ; the general action was copied from her parents, but the details were originated by herself. People said, she was " imagining " herself to read.

Soon afterwards, cases even less dubitable come thickly enough ; from the third to about the eighth year, imaginative play invests cognitive development with one of its most striking characteristics. Children dress, undress, and nurse their dolls as imaginary babies. They build up and knock down their sandheaps as imaginary puddings and castles. They shuffle along the ground as imaginary railway trains. They offer any object, a pen, a thimble, or a piece of paper, as a mock pound of potatoes, for which they demand an equally mock payment. They will act for hours at brushing up the dust, cooking the food, serving the tea, feeding the chickens, paying a visit, conducting an omnibus, administering medicine, one and all fictitious. After having been taken to church, the leader will wrap himself up in a white table cloth, stand upon a chair, and pronounce pretended prayers, while the remainder kneel before him in no less pretended devotion.

Daydreams. So far, it will be noticed, the imaginative barque is still anchored down to some real experience, perceptual or motor. But soon it begins to break loose ; just as occurs with intellect and memory, so here too with imagination, the child's ideas develop sufficient stability to operate alone. His fictions are no longer limited to what he can dramatize, but extend to all that he can think. In pure

fancy, he discovers a boundless treasure of gold and silver, or eats inexhaustible ice-cream ; or in the case of a girl, she wears a new silk dress every day, and lives in a palace with a piano in each room.

Fictive Literature. Subsequently, the child's imagination breaks away from another restraint besides that of experience, namely, egoism. He begins to make stories in which the hero is some one else than himself. But in respect of these less stimulating romances, he is generally content with acting the part of audience. He listens intently to the nursery rhymes and fairy tales composed by others. And hereby the operation, though still often called imaginative, acquires a markedly different type (akin to that given on pp. 117 ff). As he grows up, his passivity in this field becomes still more pronounced. He gladly enters into his heritage of fictive book and stage, and appreciates, so far as his capacity and opportunity allow, the creations of a Shakespeare, a Goethe, or a Dante. But original literary creation he now completely abandons to a comparatively small group of special experts.

Analysis. The submitting of all this fiction to a general analysis may be seen from our present vantage point of view to offer no longer any serious difficulty. The sham prayers of the children, for instance, manifestly consisted in their carrying out themselves certain actions analogous to what they had seen done by the minister and his congregation. But such doing of analogous action is at bottom nothing else than the educing of correlates (see p. 105). An old system of relations is applied to a new situation, or rather to some item in such a situation. This new item serves as the initial fundament, whilst the ensuing action is the correlative fundament.

Among the classes of fundament involved most frequently in fictive literature are the following. Those of space, which have bred "Lilliputians" and "Brobdingnags," and "men whose heads do grow beneath their shoulders";¹

¹ Cf. La Fontaine :

"I have seen, said one, a cabbage as large as a house,

And I, said the other, have seen a cooking pot as large as a church."

those of time, which have enabled Puck "to put a girdle round the earth in forty minutes," and have fashioned the time-machine by whose agency day and night alternate so rapidly that they "flicker"; those of number, which have sounded "the music of the spheres"; and those of ethical traits, which have generated the purity of a Sir Percival and the villainy of an Iago.

EXAMPLES FROM ABSURDITY

Allied to the quality of fiction is that of absurdity. And accordingly, the operations manifesting this latter quality are commonly also attributed to the imagination.

Pathology. The extreme varieties of this type, naturally, are those engendered by pathological conditions. Thus, when a man begins to interpret the most ordinary expressions and gestures of people in the street as indicating some deep plot against himself, such distrust is said to spring only from his own diseased imagination. To the same source is attributed the claim of the insane man to be the pope, the heir to a throne, the father of God, or perhaps even all these at the same time. And the imaginative power continues to be invoked in explanation when the absurdity resides, not in ideas, but in percepts. Such, for example, is the alcoholic's seeing of rats, snakes, and spiders; the paranoiac's hearing of internal voices that insult him; the erotic woman's feeling that her bones are being broken by a ravisher.

The form of all such delusions, illusions, and hallucinations, however outrageous, would appear to be precisely the same as in the case of fiction, namely, once more, the eduction of correlates. Thus, in the last quoted instance, the sensations proceeding from the limbs are at first cognized as actually experienced. But upon this there immediately supervenes some obsessing notion of sexual relations. Thereupon, the experience and the sexual relations together generate the correlated pseudo-percept of ravishment.

Dreams. The same analysis is no less applicable to the case of dreams. Of these, the most simple and most easily

interpretable are such as have derived their characteristic features from experimental stimulation. The following instance is illustrative :

“ A person over whose mouth and nose I had laid a light silk handkerchief, awoke after a considerable time with a cry of terror and with much sweat on his forehead and the palms of his hands. He had dreamt that he had been buried alive and had awoke in his coffin.” ¹

Even the more elaborate theories of dreams, such as the Freudian and the Jungian symbolism, would appear to need—so far, at any rate, as they are supported by good evidence—a reduction of the dreaming to the same basal process of correlate education. Take, *e.g.*, the reported dream sentence, “ Follow the Grave-Diggers.” ² The psycho-analytic interpretation of this sentence was that the dreamer, after being obsessed by certain tragic remembrances, had arrived at the belief that

“ gravediggers are those who in burying the dead do a public service. . . . She, too, must get rid of her symbolical corpses, these dismal emotions that she drags about with her.”

Here, as may easily be seen, the general form of the cognitive operation is that of the familiar mental test of Analogies. The Analogy would simply run as follows :

“ Dismal Emotions should be to Me,
as the Dead are to—the Gravediggers.”

Almost all that has just been said about the absurdities of insanity and of dreams might be repeated about the distortions of truth which are merely due to the bias of strong emotion, desire, or even bare expectation. Indeed,

¹ Spitta, *Die Schlaf- und Traumzustände der menschlichen Seele*, 1892, p. 278.

² Constance Long, *Psychology of Phantasy*, p. 115.

the kinship of the two cases has become a commonplace of popular literature.

"Lovers and madness have such seething brains,
Such shaping fantasies, that apprehend
More than cool reason ever comprehends."

Ignorance. Even without such perturbations by illness, sleep, or emotion, however, the title of imagination can be earned by errors due to sheer ignorance, if only this be gross enough. Of such kind is the imaginative belief of the savage that a clock is an all-powerful spirit watching over its owner ; that souls grow upon a soul-tree, whence they are brought by birds, which are then killed and eaten by expectant mothers ; or that divine favour can be secured by slaying so many slaves that their blood makes a lake large and deep enough to float a boat.

Tending in the same direction are the beliefs of young children that dolls are benefited by pressing an empty medicine spoon against their mouths, or that God every evening puts on a nightgown and goes to bed.

EXAMPLES FROM INSPIRATION

So far, the performances ascribed to the imagination have been distinguished from those of other cognitive powers by the attainments of results that are either admittedly fictitious or else manifestly absurd. But now we come upon feats credited to it which are distinguished, no longer by inferiority, but by superiority. The cognitive content arrives with such suddenness and luminosity as to elicit a theory of some origin higher than the bare force of reason. In the more homely instances, the event may perhaps be merely called a "happy thought" ; but in more exalted ones, it is said to be "inspired." In either case, it is still commonly attributed to the power of imagination or invention.

Physical Science. From such source have been supposed to derive the chief advances of physical science. A well-known expression of this view is the saying of Voltaire, that

Archimedes must have had at least as much imagination as Homer. The stock example has been the achievement of Newton in becoming aware that the motions of the heavenly bodies follow the same law as the fall of an apple. Among other instances frequently cited of an imaginative flash bringing together what had previously seemed to lie widely apart, are the identification of rust with combustion by Priestley, that of lightning with electricity by Franklin, that of a skull with a vertebra by Oken. To such imaginative origin is, also, commonly credited any exceptionally wonderful mechanical apparatus, as the steam engine of Hero, the telescope of Lippersheim, the hydrostatic balance of Galileo. To it Jansen is said to have owed the compound microscope, Torricelli the barometer, Niepce photography, Morse telegraphy, and so forth in great number.

Psychic Invention. Similar inspirations have been taken to quicken also psychic invention. An early instance is supplied by Cicero's treatise entitled *De Inventione Rhetorica*. Long subsequently, we meet the complaint of Leibniz, that the faculty of invention—in this same Ciceronian sense of originating proofs—is foolishly overlooked by mathematicians.¹ And just the same complaint is being re-raised by authors of great repute at the present day, the originating of proofs being emphatically attributed to the power of imagination. Still more often does this power obtain the credit for devising doctrines in philosophy and even in religion. And its predominance is acknowledged universally in aesthetic composition, whether that of a musical sonata, a pictorial chiaroscuro, a sculptural group, an architectural decoration, or a stanza of poetry.

Hypothesis. Of conspicuous importance, also, not only for science both physical and psychological, but at least equally so for the conduct of ordinary life, is the part attributed to imagination in devising hypotheses. And closely akin to these are evidently the procedures adopted in the so-called "trial and error." A hypothesis is at bottom only

¹ *Sur l'Entendement humain*, bk. iv. ch. xvii.

a theoretical trial ; and conversely, a trial can, without much straining, be regarded as a practical hypothesis.¹

Analysis. Let us analyze first the case of hypotheses. An example may be picked from the admirable work of Dewey.² Here, the percept of a stick projecting in front of a boat suggested in turn that such a stick might be for the purpose of a flagpole, an ornament, or an apparatus of wireless telegraphy. Now, every one of these suggestions obviously has its source in some analogy to previous percepts of sticks. And in similar fashion, every procedure by trial and error may confidently be taken to have its source in analogy to some procedure adopted previously. But all such evocation of ideas of actions by analogy brings us at once back again to the eduction of correlates (see p. 105).

As another typical case of these serviceable functions of imagination, we may turn to the still more exalted plane of literary genius. One night, the present writer happened to notice an exceptional moon, crescent in shape, brilliantly golden in hue, and set in a sky that sparkled with stars. The scene recalled to him Victor Hugo's beautiful comparison of such a moon to the sickle of a God.

" Quel Dieu, quel moissonneur de l'éternel été
Avait en s'en allant negligemment jeté,
Cette faucille d'or dans le champ des étoiles ? "
(Booz endormi).

The opportunity was seized to rehearse the mental movement by which such a striking comparison could possibly have been effected. The rehearsal was performed easily enough ; it took place in a remarkably constant and, as it appeared, natural manner. First of all, the percept of the moon seemed plainly able to evoke the idea of a similarly shaped sickle in just the same way that a person can at will

¹ Recently, a luminous exposition was given by Claparède of how largely both hypothesis and trial and error contribute to what are commonly called manifestations of "intelligence" (*Lectures given at the University of London, 1922*).

How We Think, 1909, p. 75.

think of something "similar to good" as already described (p. 148); that is, by means of a correlate eduction closely followed by a reproduction.

The imaginative operation, as depicted in the thought experiment, then passed into a second and more complex stage. To begin with, the idea of the sickle proceeded to reproduce, by simple association, that of "reaping." Next came a vague awareness to the effect that the lunar scene differed from usual reaping in being much grander; the process here was that of educing a relation. After this, and more characteristic of the whole operation, came a mental movement from the idea of "usual reaper" conjointly with that of "much grander than" to a notion which verbally can only be rendered—most inadequately—as "reaper-far-surpassing-humans"; the process is evidently the eduction of a correlate. Last of all, the vague and wordless "reaper-far-surpassing-humans" quite suddenly reproduced by resemblance the definite and verbally expressed "God." Thus, despite several complications, this second phase has still in its most characteristic portion the very same form as the previous evocation of a simile, namely, that of a correlate eduction followed closely by a reproduction. The educted correlate is in itself inclined to be obscure, unstable, and even uninteresting; but it forms an indispensable bridge to the reproduct, which is a familiar concept, laden with further ideas, beliefs, and usually emotions. In the present case, the correlate "like-humans-but-grander" is by itself limp and helpless. But it is immediately galvanized into life, and with it the whole passage, on its reproducing a concept so richly fraught with significance as "God."

Now, without presuming to assert that Victor Hugo's mind followed exactly the course here described, still such a course was in the thought-experiment to a large extent actually performed; the eductions were strictly carried through, and the reproductions showed themselves to be entirely natural ones. There is, then, provisionally at least more reason to suppose that the poet's actual composing

was done in a kindred manner than in any way basally different. And quite similar results could be given as having ensued from similar analysis (by the present writer) of numerous and varied other cases of the general class we have been considering. Even those instances that at first sight seem to possess a very different form have on closer scrutiny shown themselves to have their basis in just the above described intimate cooperation of correlate eduction with reproduction. This, then, would appear to be acceptable as a general analysis of the kind of imagination that supplies sudden mental illuminations.

REALIZATION OF THE ABSENT

There remains one more field of imagination to examine. This has the interesting feature that it incites many writers and speakers distinguished not so much by special mastery of psychology as by brilliance in general—leading politicians, financial magnates, star actors—to intervene with public warnings of danger and counsels of remedy.

The Distant and the Past. This is, namely, the imagination which obtains the credit for supplying adequate realization of remote places and bygone ages. An example of the said counsels is the following address given to a university by a Chancellor of the Exchequer :

"Often you find in men an absolute incapacity to realize an unfamiliar situation, to grasp conditions which are not immediately visible, to recognize facts which to others are a plain and patent element in their lives. That incapacity springs from a dull and uncultivated imagination. . . . Men who are feeble in their power to imagine are what I call a dangerous element in the formation of public opinion. . . . A House of Commons without imagination, to my mind are (*sic*) a bad House of Commons."¹

¹ Goschen, *The Cultivation and Use of the Imagination*, 1893.

As remedy for this dangerous mental defect, the eminent speaker suggests the perusal of *Alice in Wonderland*, or Grimm's *Fairy Tales*.

The Future. As regards analogous realization of the future, sometimes—rather unexpectedly—successful conduct is said to depend, not upon the presence of the power, but upon its absence. A recent example is the demand of many military aviators, that the candidates for their kind of fighting should have an "unimaginative" temperament, apparently meaning that courage and skill rather lose than gain from a too vivid anticipation of the possible contingencies. Much more usually, however, is the view of the imagination as being extremely beneficial. Military experts tell us that this is the power which stamps the truly great strategist. Social reformers plead that the requirements of it must be the first step towards national regeneration. Biologists explain that the organism has urgent need of incurring future disaster in imagination that it may anticipate and avoid incurring it in reality.

Analysis. Now, these views of imagination have underlying them an unusually strong tendency to hark back to the literal meaning of the word, that is, the forming of "images." But really, the latter have been shown to possess unexpectedly little cognitive effectiveness (Ch. XI.). When they do supervene, they are mere satellites of the thought which has evoked them.

Explanation, then, is only required of how the thought itself manages to attain to the absent. And our principles have indicated that there is one process alone by which such a feat can possibly be achieved; it consists, once more, in the eduction of correlates (p. 106). By virtue of this process and no other it is that a House of Commons can "grasp the conditions which are not immediately visible," an aviator foresee the experience of going down in flames, a strategist devise far-sighted plans of campaign, or a sociologist build up mentally the fabric of New Republics.

CONCLUSION

From beginning to end, then, this alleged imagination, in the sense of the creative faculty of the mind, shows itself to be always at bottom some eduction of correlates, to which there may or may not be added an immediately following and intimately cooperating reproduction. The popular view, that there exists an imagination as a creative faculty does not appear to assert too much, but rather too little; for *every* noetic process possesses, in addition to its function of discovering truth, that also of creating mental content (p. 61). If there exists no special power of imagination in the creative sense, this is only because all our qualitative principles throughout all their manifestations constitute in this sense one general imaginative power. Such generative virtue is exactly the feature which we have endeavoured to show forth conspicuously by saying that the primary cognition is "*noegenetic*."

As for the reason why the generative virtue has not been detected in all the other cases also besides those commonly designated as "imaginative," this would seem chiefly due to the difficulty of psychological analysis. A further obstacle, however, has probably lain in the fact that the generative aspect of cognition has been largely masked by its other and practically more important aspect of truth-getting. Only when the truthfulness is intentionally derailed as in the case of fiction, or is obviously vitiated as in the case of absurdity, or tempts away explanation into mysticism as in the case of sudden illumination, or transcends a supposed metaphysical limit as in the case of apprehending the absent: only in such cases as these is the generative aspect too obvious to escape notice altogether. Even then, however, it in general still fails to be detected except in that process where the originality reaches its highest degree, namely, in the eduction of correlates (p. 107).

Since, thus the fault of assuming imagination to be a separate power does not lie in too high but a too low

estimate of cognitive creativeness, what shall we say of the rival theory of imagination which has been put forward by the majority of professed psychologists and which claims to have explained the creativeness away, resolving it into mere combined reproduction? It would, from the preceding analysis, appear to be the very antipodes to the truth.

The wonder is that its extreme improbability was not already obvious *a priori*. Take all the items, cognitive and affective, present at any moment, either in consciousness or in subconsciousness. Add, if you will, such items as can possibly be supposed to be somehow effective in absolute unconsciousness. Take into account the entire scope of possible reproductions that all these items can respectively cause, whether by contiguity or by similarity. And let each of these reproductive tendencies be effective in the precise strength prescribed by the laws of retentivity, mental energy, fatigue, and conative reinforcement. Can we reasonably suppose that all this utterly heterogeneous multitude of tendencies will by the most extraordinary of chances sum up into anything that is in the slightest degree orderly? Can it be expected to march together forward in the grand unity of a drama by Aeschylus or of a symphony by Beethoven? As well might one believe that all the gusts and eddies and back-currents of the changing winds will jointly build up random assortments of loose leaves and twigs into dainty bird-nests!

CHAPTER XXI

SUMMARY AND OUTLOOK

NOEGENETIC PRINCIPLES AND PROCESSES.

Quest for Ultimate Laws. The Apprehension of Experience. The Education of Relations. The Education of Correlates. General "Form." The "Material."

QUANTITATIVE PRINCIPLES AND PROCESSES.

Physiological Aspect. Mental Energy. Retentivity. Fatigue. Conative Control. Primordial Potency. Three Anoegenetic Processes. Compound Operations. Conspectus.

PROBLEM OF "INTELLIGENCE."

Choice of Interpretations. Reference to Mental Tests. Reference to Instinct and Comparative Psychology.

FINAL UNISON.

Prospect of Science. Structure of Mental Life. Scheme of Cosmos. Foundation of Psychology.

NOEGENETIC PRINCIPLES AND PROCESSES

Looking back over the course of this volume, we may recall how at the outset the current psychology of cognition—despite the prevailing optimistic opinions about it—revealed itself to be really in a lamentable state. Among the gravest symptoms, but no more than a symptom, we noticed that it at present stands split up into two separate halves; the one is the so-called general psychology, as expounded in the ordinary text-books; the other is experimental, as cultivated in laboratories and hardly voiced at all except in certain special journals. Thus unnaturally divorced from each other, the general half could not but remain empty; the experimental half, blind.

A glimpse was then caught by us of what appeared to be

the root of all the evil. This consisted in the fact that hitherto—notwithstanding all the labour bestowed upon it for over two thousand years—psychology had never yet been provided with its prime requisite, a genuinely scientific foundation. For this can only be of one kind; it must necessarily be constituted of *ultimate laws*, and in *this sense* “principles.” Could only such be discovered, then at last, we confidently believed—and the same had been already divined by James—psychology would no longer be “only a hope of a science,” but would take instead its rightful place alongside of its natural compeer, physics.

Now, by good hap, this quest for ultimate laws has proved to be actually feasible. Out of our inquiry there has emerged the basal constitution of the mind in unexpected regularity and simplicity. Cognitive events do, like those of physics, admit throughout of being reduced to a small number of definitely formulatable principles in the sense of ultimate laws. A doctrine has in this manner been evolved which, to distinguish it both from the still reigning facultism as also from the now moribund associationism, is here characterized as that of “noegenesis” (p. 61).

Apprehension of Experience. To begin with, the source from which all cognition originally springs is beyond question *experience*. But in order to make this proposition fruitful, or even true, the word must not be taken in the broader, but in the narrower of the two meanings that ambiguously shimmer in it. It must mean that which is immediately “lived, undergone, enjoyed, and the like” (p. 36). It thus consists, on the one hand in mental states or “affections,” and on the other in cognitive and conative acts. Among the states are to be reckoned in particular the *initial* effects of all kinds of sensory stimulation. As inhering in the experience must be counted, also, the experiencer; just as there can be no movement without something that moves, so too there can be no affection without some subject affected, nor act without some one acting (p. 53).

Such experience, both its direct attributes¹ and its subject—so our first principle enounces—admit of being cognized. A person cannot only feel, but also know that he feels; not only strive, but know that he strives; not only know, but know that he knows. This supervening of knowledge upon experience, however, would appear to be only a possible, not a necessary event. On many occasions, probably the great majority, it never happens at all (Ch. XI.). One special case of this—but by no means the sole one—is that of subconsciousness. The first cognitive principle runs, then, as follows: *Any lived experience tends to evoke immediately a knowing of its direct attributes and its experienter* (p. 48).

Eduction of Relations. With the preceding words, we explicitly accept the view held almost universally since the earliest days, that all knowing begins in actually occurring experience. The frequently expressed or implied addition, however, that genuine knowing extends no farther than such experience, has in the present work had to be repudiated. On the contrary, the existence has been shown of another and radically different kind of knowing, where the immediate basis may consist of nothing more than bare presentations; for between all characters, whether simultaneously experienced, or merely presented, at least *relations* can be known. The latter are, so to speak, drawn out or "educated" from the very nature or essence of the characters as presented (p. 78). For example, the relation of difference can be educed as holding between "absence" and "impossibility," although neither of these can ever be characters of any actual experience. Accordingly, the second principle may have the following formulation: *The presenting of any two or more characters tends to evoke immediately a knowing of relation between them* (p. 63).

Some detailed examination has been made of the general constitution and chief properties of the process which ensues

¹Such direct attributes of experience include not only its characters, but also certain of its relations (p. 77). These latter might be called "accidental," as opposed to the "essential" relations cognized by virtue of the *second* principle.

from this principle. Especially remarkable is that the relations so educed can themselves serve as fundamentals whence further relations can be derived in similar manner, and so on without definite limit (p. 82). And additional fundamentals for the operation of this second principle are supplied in the products of a third one to be brought forward next. Very notable also is a consequence deriving immediately from the fact (mentioned on the preceding page) that all such fundamentals may either be or not be directly apprehended in experience, else may be only presented mentally. For the ensuing processes fall into two corresponding groups; the former is especially concerned with "perceptual" operations, whilst the latter reigns in those commonly called "intellectual" (p. 300).

The Eduction of Correlates. If the preceding principle has but seldom if ever met with clear and full recognition in psychology, immeasurably less adequate still has been the notice accorded to the facts which come to expression in the third. Formulated, this runs: *The presenting of any character together with a relation tends to evoke immediately a knowing of the correlative character* (p. 91). For example, if the idea of "good" and that of "opposite to" are presented, there can out of these be obtained the correlative idea of "bad."

This third principle keeps closely parallel to the second. It is, like that, of an educative nature. Also, it is always applicable when, and only when, the second is so. Finally, the two ensuing respective processes always lead to exactly the same eventual result; they differ solely in respect of where the line comes between the items given initially and those arising in the process. But this last difference is of extreme importance; for in the case of the third process, the generated item is no longer a mere relation, but now itself a fundament. Moreover, this fundament can quite well be external to the experiencer; by this means, and no other, a person is able to think of times, places, persons, and matter outside of himself (p. 106).

General Form. All these three principles possess several great properties in common. The first is that the processes in which they become manifest take the form of self-evident propositions (although, of course, in themselves wordless); for example, "I am pleased," "red and green are different," "twice two is four." To denote this characteristic property, the principles might be given the common name of "noetic"; in so doing, however, this word would be taken in a far broader signification than has been adopted by any of its numerous previous users, ancient and modern. The second great property manifested in all three processes is that they generate items of cognitive content; thus, in the cases just quoted, the items generated are "I-am-pleased," "different," and "four." To emphasize their being thus both noetic and generative, the principles have here been summarily characterized as "noegenetic" (p. 61).

Another basal property in which all three principles are alike is that the resulting growth of mental content necessarily proceeds along two simultaneous lines. It moves by a smooth waxing from absolute zero of intensity and determinateness through gradually increasing degrees of both these. This befalls it, not merely at its remote origin in the race, or at its first occurrence in the life of the individual, but on *every single occasion* (pp. 156 ff.). These two growth-characters, however, do not necessarily maintain strict proportionality to each other. In particular, the mental objects may have such low intensity as to elude all introspection and thus appertain to subconsciousness, whilst still retaining such a high degree of determinateness as to be very effective for the purposes of further cognition (p. 166). Usually concomitant with but less basal than these two growth-characters is a third, that of differentiation.

"Material." Having thus characterized the "form" in which the principles are manifested, it remains to settle the scope of the "material" to which this form can possibly be applied. As regards the first principle, such material has

been indicated already, namely, the states and acts of an experienter. But the second principle introduces, further, all humanly cognizable relations. And the third principle brings in additionally all possible correlates to such relations. Evidently, then, a supreme task is to discover what relations do so fall within the bounds of human possible ken. They are in the present work divided into ten classes, which can here only be afforded space for bare enumeration. They may be either "real" or "ideal." To the first category belong what have here been given the names of Attribution, Identity, Space, Time, Cause, Objectivity, and Constitution. To the second category fall Likeness, Evidence, and Conjunction (pp. 67 ff).

QUANTITATIVE PRINCIPLES AND PROCESSES

The foregoing three noetic principles have sole reference to quality. They delineate all primary cognitive operations directly in respect of form, and by inference in respect of material ; but they say nothing as to how far these operations arrive at being actually executed. They therefore require to be supplemented by a further set of principles, this time not qualitative but quantitative.

Of such there appear to exist five ; and these are applicable to all cognition whatsoever, from the highest down to the lowest. But they do not belong to the main topic of the present volume ; they have only been introduced just so far as was indispensable in order to get a complete account of the still more fundamental qualitative or noegenetic principles. Their deeper study has been reserved for subsequent occasions.

Physiological Aspect. Between these two systems of principles, qualitative and quantitative, there is a remarkable contrast from the standpoint of physiology. The qualitative system appears to offer no grip at all for explanations of physiological order ; the more it is examined, the more utterly mysterious becomes the psycho-physical connection altogether. But as regards the other system, such

connection is far otherwise. Once let the general and undeniable, however inexplicable, fact be definitely accepted that the qualitative or noegenetic principles do somehow or other come to manifestation by physiological means, then all further and merely quantitative mental principles (except perhaps the fourth) not only admit of, but irresistibly press for, physiological expression.

General Energy. Turning, then, to enumerate these quantitative principles, which have such a strong physiological bias, the first may be formulated as follows: *Every mind tends to keep its total simultaneous cognitive output constant in quantity, however varying in quality.* Thus, here again we reach, by an entirely new route, the above-mentioned theory of Two Factors. And once more, these can be most conveniently expressed in physiological terms. The brain may be regarded (pending further information) as able to switch the bulk of its energy from any one to any other group of neurons; as before, accordingly, the amount and the direction of the disposable energy regulate respectively the intensity and the quality of the ensuing mental process (p. 131).

Retentivity. The second quantitative principle is that, *The occurrence of any cognitive event produces a tendency for it to occur afterwards.* This manifests itself in two distinct ways. The one is that of inertia or *lag*; cognitive processes always both begin and cease more gradually than their (apparent) causes. The other is that cognitive events by occurring acquire a *disposition* to occur subsequently. This latter class of manifestation includes as a special case of peculiar importance the law of *association*; it is to the effect that cognitive events accompanying each other thereby acquire a bias towards doing so afterwards (p. 134).

Fatigue. The third principle, almost exactly the reverse of the last, is that of fatigue. It runs, *The occurrence of any cognitive event produces a tendency opposed to its occurring afterwards.*

Conative Control. The fourth is that, *The intensity of*

cognition can be controlled by conation. From this principle derives chiefly the whole notion of mental "powers." In it lies, too, the key to such truths as underlie the doctrines of Freud and Jung.

Primordial Potency. The fifth and last principle enounces that, *Every manifestation of the four preceding quantitative principles is superposed upon, as its ultimate basis, certain primordial but variable individual potencies* (p. 136). Under this heading come pre-eminently the influences of heredity and of health. Here, the physiological leaning becomes so strong, that there is even a difficulty in devising any mental formulation at all.¹

Anoegenetic Processes. These five quantitative principles, besides governing the amount of the noegenetic processes, also originate conjointly three further processes of anoegenetic order. The first is that of *reproduction* (p. 137). This resembles all the noegenetic processes in that some item or items come to awareness, but differs from them in that the same items must necessarily have been mentally presented before. The next anoegenetic process departs from all the foregoing in that it consists, not in any mental apparition of items, but on the contrary in some *disparition* of them (p. 138). After all these, the only remaining possible kind of process is where no items either appear or disappear, and consequently the change constituting the process is limited to some *variation of clearness* (i.e. of intensity or of determinateness), (p. 139).

Compound Operations. All these cognitive processes, both noegenetic and anoegenetic, are aggregated together in immense numbers, just as are the organic cells of material organisms. Sometimes, notwithstanding, the single units remain still easily distinguishable. But at other times—often even when the whole operation superficially seems most simple—they may be crowded together so closely that to discriminate one from another demands the greatest care.

¹ As to the part played by heredity, see in particular the remarkable little work of Nunn on *Education, its Data and its First Principles*, 1920, especially ch. ix.

In general, however, out of the whole cluster of processes involved in any total (short) cognitive operation, only one or a very few are *crucial* for its success; these alone, with most persons, lie nearly balanced between possibility and impossibility of occurrence. Such crucial processes (as, indeed, all the points mentioned in this section) are of especial significance for the construction and employment of mental tests.

Conspectus. In concluding this section, some convenience may be derived from the following table, in which the more important of our results are represented compactly:

	Principles (form)	Suggested physiological explanation.	Elementary processes (form).	Material.	Develop- mental characters.
Quality (noogenesis).	I. Apprehensibility of Experience.	?	I. Apprehension of Experience.	Direct attributes of Experience.	
	II. Educatibility of Relations.	?	II. Education of Relations.	Educated relations and correlates.	
	III. Educatibility of Correlates.	?	III. Education of Correlates.		
Quantity (anoogenesis).	I General Energy.	Common energy and alternative neuron-groups.			I. Intensity.
	II. Retentivity.	Action-time and residual excitement, weakening of synaptic resistance, attunement of molecular structure.	I. Reproduction. II Disparition. III. Clearness-Variation.	Any of the above.	II. Determinateness.
	III. Fatigue.	Dissimilation of tissue, toxins, inhibition.			III. Speed.
	IV. Conative Control.	?			
	V. Primordial Potency.	Neural constitution.			

As for the *compound* operations, the chief leading types appear to be those which involve the following :

- I. A sentient basis (p. 78).
- II. Coordinate Diffusion (pp. 84, 137).
- III. Multiple Levels (p. 82).
- IV. Education blended with reproduction (Ch. X.).

It may be added that many other important characters, such as Differentiation, Integration (or Synthesis), Disintegration (or Analysis), Accuracy, Perseveration, Oscillation, are still only *secondary*, being all inferrible from those given above.

PROBLEM OF "INTELLIGENCE"

The aforesaid qualitative and quantitative principles, together with the six processes in which they become manifest, would appear to exhaust the whole scope of cognition. Accordingly, they must serve as the master-key to all scientific cognitive analysis.

Choice of Interpretations. By aid of them we have easily been able to demonstrate the inward constitution of the classical faculties of Perception, Intellect, Memory, and Imagination, as also of the less regarded one of Movement (Chs. XV.-XX.). In parallel manner, all other faculties which have been suggested at any time, in so far as they are based unequivocally upon actual facts, seem completely reducible to the same ultimate terms. The current "apperception," "selective thinking," "building up of complexes," "applying what has been learnt," and so forth, can in this way be disposed of readily enough. Even "attention," in spite of its strangely diverse modern definitions, can be analyzed without remainder into, and at last receive its adequate explanation from, these same terms again (p. 162).

But as much cannot be affirmed of the arch-faculty here specially interesting us, the chameleonic "intelligence." For this we found to have in modern times degenerated into a word possessing no definite meaning whatever (p. 20).

The question at issue, then, is no longer what it actually denotes, but rather what it shall be made to denote; we are faced by the necessity of choosing between numerous alternatives. Most drastic of them would be to relegate the now so disfigured word to the limbo of mere popular usage. Another plan could be to attempt to restore to it something not unlike its ancient status as cognate to the mediaeval "intellect"; with this aim, its scope might be restricted to a special case of our principle of educing relations, the case where the fundamentals of the relation are highly abstract. On the whole, however, circumstances appear to be driving us towards yet another alternative, which consists in extending the range of the word so as to cover all three noegenetic principles in every one of their manifestations.

Reference to Mental Tests. Especially pressing towards this decision is the great problem from which the present volume first set out, namely, as to the nature of that kind of "intelligence" which has been measured for literally millions of men, women, and children by means of mental tests.

With regard to the manifold theoretical definitions that have been lavished upon this—the "judgment," the "comprehension, invention, direction, and censorship," the "adaptability to new situations," the "sensitiveness to significant combinations between experiences which illuminate one another," and so forth endlessly—with regard to all these, little more need here be said. For the most part, they cannot be admitted to define genuinely any psychological processes at all. And with the brilliant exception of Ebbinghaus, not one even of their own authors appears to have been able to make any actual use of them (p. 13).

Turning to the tests that have really been employed, these seem to have always been unrestricted to any cognitive processes of any particular form. Certain forms are, indeed, growing more and more frequent; but this fact has come about casually rather than by deliberate intention; most often, the motive has only been to obtain a better agreement

with some further estimate of intelligence picked up somehow or other unexperimentally. In order, then, to secure an even tolerable concordance with this unrestrictedness in the commonly accepted procedure for testing, the word "intelligence" must, as just said, be taken to include all the processes derived from all three principles.

Nevertheless, although such testing does in this way deal with all these diverse processes, it certainly does not *measure* them all, or even any one of them. For the procedure in testing is to apply a large group of the tests together, never regarding the results of any one separately, but throwing all into a common pool (p. 9). The marks obtained by the testee from such a mixture can no more be expected to indicate his degree of success with any particular constituent than, say, the weighing of a pile of baggage is able to tell the weight of any particular portmanteau in it. Equally baseless, as has been shown, are the pretensions of this testing procedure to measure any "average" or "level" of all the different possible processes (p. 14). What really is measured—and alone ever can be measured—by such a pooling of miscellaneous items is the factor (should one exist) which, amid continual diversification otherwise, persistently enters into them all. This factor is no process of intelligence of any sort. Nor, by itself, does it even furnish any sort with a measurement. Really to measure any intelligence-process whatsoever, due account must be taken, not only of the said factor shared with all others, but also of the supplementary factor peculiar to itself. In terms of our psycho-physical hypothesis, there is need of ascertaining, not only the potential of the general "energy," but also the effectiveness of the specific "engine" employed (p. 5).

Reference to Instinct and Comparative Psychology. There remains to consider the bearings of our work on the other most conspicuous usage of the term "intelligence" in modern psychology, namely, as contrasting with "instinct" (p. 16). Pre-eminent among the many definitions, or quasi-definitions, given of intelligence in this reference, is the portrayal of it

The question at issue, then, is no longer what it actually denotes, but rather what it shall be made to denote; we are faced by the necessity of choosing between numerous alternatives. Most drastic of them would be to relegate the now so disfigured word to the limbo of mere popular usage. Another plan could be to attempt to restore to it something not unlike its ancient status as cognate to the mediaeval "intellect"; with this aim, its scope might be restricted to a special case of our principle of educing relations, the case where the fundamentals of the relation are highly abstract. On the whole, however, circumstances appear to be driving us towards yet another alternative, which consists in extending the range of the word so as to cover all three noegenetic principles in every one of their manifestations.

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as a "learning by experience," to which is added the clause that it "modifies behaviour." But here, waiving the pernicious ambiguity of the term "experience" (p. 36), there are obviously two separable occasions concerned, those of the original and of the modified behaviour respectively. Take as example a man shooting at pheasants driven down wind; on the original occasion he is not unlikely to find himself only blowing away their tails; accordingly, on subsequent occasions he will aim more ahead. The term "learning" would appear appropriate only to the original occasion. But surely the subsequent and more successful efforts must be regarded as no less "intelligent."

Now, in the light of our principles, the analysis of such cases becomes perfectly straightforward; upon the original occasion, the main feature of the cognitive operation always consists in educing relations (second principle); upon the subsequent occasions, in educing correlates (third principle, p. 104). Hence, judged from the standpoint of modifying behaviour, just these two *non*-experiential principles most conspicuously deserve the name of intelligence. The genuinely experiential form of learning (first principle), far from constituting as alleged the whole domain of intelligence, would appear to be precisely that form which has the least obvious claims to the name. If, however, as seems most natural after all, we agree to designate even this also as "intelligent," then nothing at all remains over for the so-called instinct; the conclusion would seem inevitable, that this latter *does not possess any separate cognitive form*.

Arguments of such a nature can be pushed much further, and they lead on to matters of increasing gravity. For since the cognitive processes of human civilized adults—alone so far considered by us—thus show themselves to run always along the inexorable lines of the three principles, then these same lines cannot plausibly be denied to the more primitive races of man. The deduction lies near, next, that precisely the same lines must also reach back to the earliest years and even minutes of all human life. And if so, then

the existing child psychology would seem in need of radical reconstruction ; a prospect is offered of raising it from its present condition of mere ingenious surmise to that of scientific inference. But at this point a question arises which is far more momentous still. Do or do not these same unbending three principles prevail on turning to the animals lower than man, the monkeys, the bees, the mollusks, and, in last resort, even the protozoa. So far and so deep do such considerations penetrate that they seem as if their issues might not impossibly some day transform the whole of comparative psychology from top to bottom.

FINAL UNISON.

Prospect in Science. Even outside of psychology proper in any of its branches, these principles threaten to bring about profound changes. Already, for instance, there have been elicited some facts that may perhaps eventually revolutionize the science of language (pp. 75, 117), and even that of logic (pp. 75, 297). Of unforeseeable magnitude are their coming effects in numerous other regions also where mind is a dominant influence, such as education, psychiatry, industry, art, anthropology, and sociology.

Still, there is comfort in the thought that these impending changes, perturbing though they may be at the time, must in the long run make towards peace and efficiency. For every such reconstruction in however manifold spheres of science cannot but bring these into continually closer union, so that more and more each one of them will become quickened with the strength of all.

Structure of Mental Life. The same key which thus fits every sphere of psychological science, pure or applied, appears equally capable of opening the way to every corner of actual psychic life. Not a cognitive operation can be performed, from the loftiest flight of genius down to the prattle in the nursery, but that it resolves itself wholly into these same principles with their ensuing processes. And all this is no

less true of the so-called "practical" doings, which common opinion naïvely supposes to constitute some separate domain. As much may be said of vocational activity also; all work, high or low, difficult or easy, admits of only one and always the same mode of ultimate reduction. With regard to the biological "environment," the "situations" and the "stimuli" of a man—as also his more philosophically pointed "private universes"—these (in so far as psychological) really consist in nothing else than portions of his cognitive field. And this latter appears to be wholly generated and governed by just these same ultimate laws that we have been examining.

Furthermore, what thus holds good with respect to the activities of life in its ordinary course must evidently do so similarly with respect to the activities artificially provoked in the psychological laboratory. As a consequence, all the ground that has been, or ever can be, covered by mental tests may forthwith be mapped out in at least general outline. And as for the old question, how far mental tests can be made really to coincide with ordinary practical life, this question—together with the criticism lurking behind it—is now answered automatically.

Scheme of the Cosmos. The same principles cannot but extend their bearings up into a more exalted region. For not only have the original data of all cognition been laid down by them, but so too has the whole set of operations by which these data can ever subsequently be augmented. And hereby the entire range of all cognition whatsoever, as regards both form and material, would appear to receive its definite and final boundaries. But then such a delimitation of the processes of cognizing must hold correspondingly good of all things as cognized; in the said principles must lie, therefore, an exhaustive determination of the entire cosmos, not only in so far as this can be truly known, but even to the extent that it can be thought of at all.¹

¹ Of hitherto proposed philosophies, our present indications seem nearest akin to the beautiful work of McTaggart on *The Nature of Existence*, 1921.

After this fashion, all enters into unison. Faculties, life, tests, and world-views, so too practice and theory, nature and artifice, philosophy and common-sense, all, so to speak, dance fatally to one and the same psychological tune.

Foundation of Psychology. In these principles, then, we must venture to hope that the so long missing genuinely scientific foundation for psychology has at last been supplied, so that it can henceforward take its due place along with the other solidly founded sciences, even physics itself. In particular, these principles (together with commentaries upon them) appear to furnish both the proper framework for all general text-books and also the guiding inspiration for all experimental labours. By this means these two halves of psychology, after having been so long unhappily cleft in twain, may now finally, like the man-woman in the Symposium of Plato, grow with great desire together again.

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PRESS COMMENTS

ON

"THE NATURE OF 'INTELLIGENCE' AND THE PRINCIPLES OF COGNITION"

"This is a first-rate work worthy of the high reputation of the author."—*Eugenics Review*, July, 1923.

"The book is one which no psychological student can afford to overlook, and its remarkable lucidity of statement and wealth and appositeness of illustration will make it easy reading for any such student."—*The Scotsman*, May, 1923.

"In conclusion, let us sum up what we consider to be the chief merits of Professor Spearman's great work. He has laid, directly or indirectly, the foundation for a scientific psychology of cognition. He has brought together experimental and theoretic knowledge of cognition. He has justified in his brilliant modern way the main theses of scholastic psychology bearing on cognition, and has respectfully acknowledged the great value of scholasticisms. He has trenchantly criticised many shallow but popular modern psychological doctrines, while generously acknowledging the splendid value of modern research work. In fine, with infinite skill and tact he has raised to the lips of the gracious and venerable Dame Psychology a phial of living water, that she may quaff it and renew her youth."—*The Tablet*, June, 1923.

"His claim to have provided a genuine scientific basis for psychology appears to be abundantly justified."—*Birmingham Post*, May, 1923.

"The book is valuable for its wide knowledge, its lucid discussions, and its thoroughly scientific spirit."—*The Nation and the Athenæum*, June, 1923.

"The importance of Professor Spearman's work can hardly be overestimated. He has broken new ground in a volume written with admirable clearness in a vigorous style. No one who is interested in the development of psychology can afford to overlook this work."—*South Wales Argus*, May, 1923.

"Nothing more solid in psychological theory has been given to us for some time; it is a sound and brilliant piece of exposition."—*Daily News*, May, 1923.

"This is an altogether remarkable book, and so far the only really successful attempt to vindicate the claim of psychology to be a science in the accepted modern sense of the term. But it is not merely that. It is a work which shows so profound an acquaintance with the historic 'psychologies' of pre-scientific days, and so just an appreciation of their merits and demerits, that we are entitled to look to it for a scientific presentation of psychology which is not only the result of observation and experiment, not only the generalisation of facts in a few pregnant 'principles,' but also for a parallel to, and a basis for, a system of rational psychology."—*The Catholic Gazette*, May, 1923.

"There can be no hesitation in stating that Mr. Spearman has written a most admirable book on a most interesting subject. In directness of style, in width of outlook, in clearness and closeness of argument, and in

wealth of illustration, alike from life and from literature, it is a book of the highest value."—*The Sunday Times*, April, 1923.

"Professor Spearman's *The Nature of Intelligence* is one of the weightiest and most original works on psychology that have appeared in recent years."—*Liverpool Daily Post*, May, 1923.

"Professor Spearman writes in a bright and sometimes humorous style; he can see the fun of psychology, and is never ponderous. The students of the future are to be congratulated on having so provocative and original a text-book."—*The Challenge*, June, 1923.

"For a wealth of illustration, cogency of argument, and lucidity of reasoning, Professor Spearman's book makes an appeal far beyond the narrow circle of academic interests."—*Sheffield Daily Telegraph*, June, 1923.

"A very remarkable and perhaps epoch-making book."—*Brit. Journ. Psych.*, 1923.

"Book of inestimable value."—*The Weekly Digest* (of Antwerp), Sept., 1923.

"Amongst the recent multitude of books on psychology there is, in our opinion, only one (that of Professor Spearman) which, according to our previous classification, may be relegated to the scientific category."—*Spectator*, Sept., 1923.

"Professor Spearman's book is a most important and epoch-making work, which is sure to have a far-reaching effect on the development of psychology. . . . All the discussions in the book are characterised by extraordinary depth and subtlety. This is combined with a rare clearness of expression and masterly finish of style. . . . It is hardly necessary to say that a study of the work is indispensable to every psychologist."—*Studies*, March, 1924.

"Without doubt this book is one of the most remarkable attempts in recent times to search critically into the present status of psychology for the purpose of ascertaining the validity of its principles and of presenting a set of fundamental laws which will enable it to take its place 'along with the other solidly founded sciences, even physics itself.'"—*Journal of Philosophy*, May, 1924.

"It's an alarming book. It suggests that we shall have to give over the fun of arguing words and begin to face facts. Our intellectual joust is ended; it is time to plant some beans! . . . He offers here what is probably the most comprehensive contribution to the psychology of intelligence since James published his principles."—*The Survey*, June, 1924.

"It may be recommended to anyone who wishes to study a profound new work."—*Vlaamsch Opvoedkundig Tijdschrift*, July, 1923.

